The Electrical Industry's Weekly Magazine

December 9, 1957

Electrical World

Price 50 Cents

A McGraw-Hill Publication

2 Specials on Transmission Design:

How to Maintain Tower Clearances at Low Temperature

...Page 73

New Tower and Bundled Conductors Field Tested at 345 Kv

...Page 76

Time to Stop Guessing on Residenti[al] Loads

...Page 79

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UNIVERSITY MICROFILMS IN
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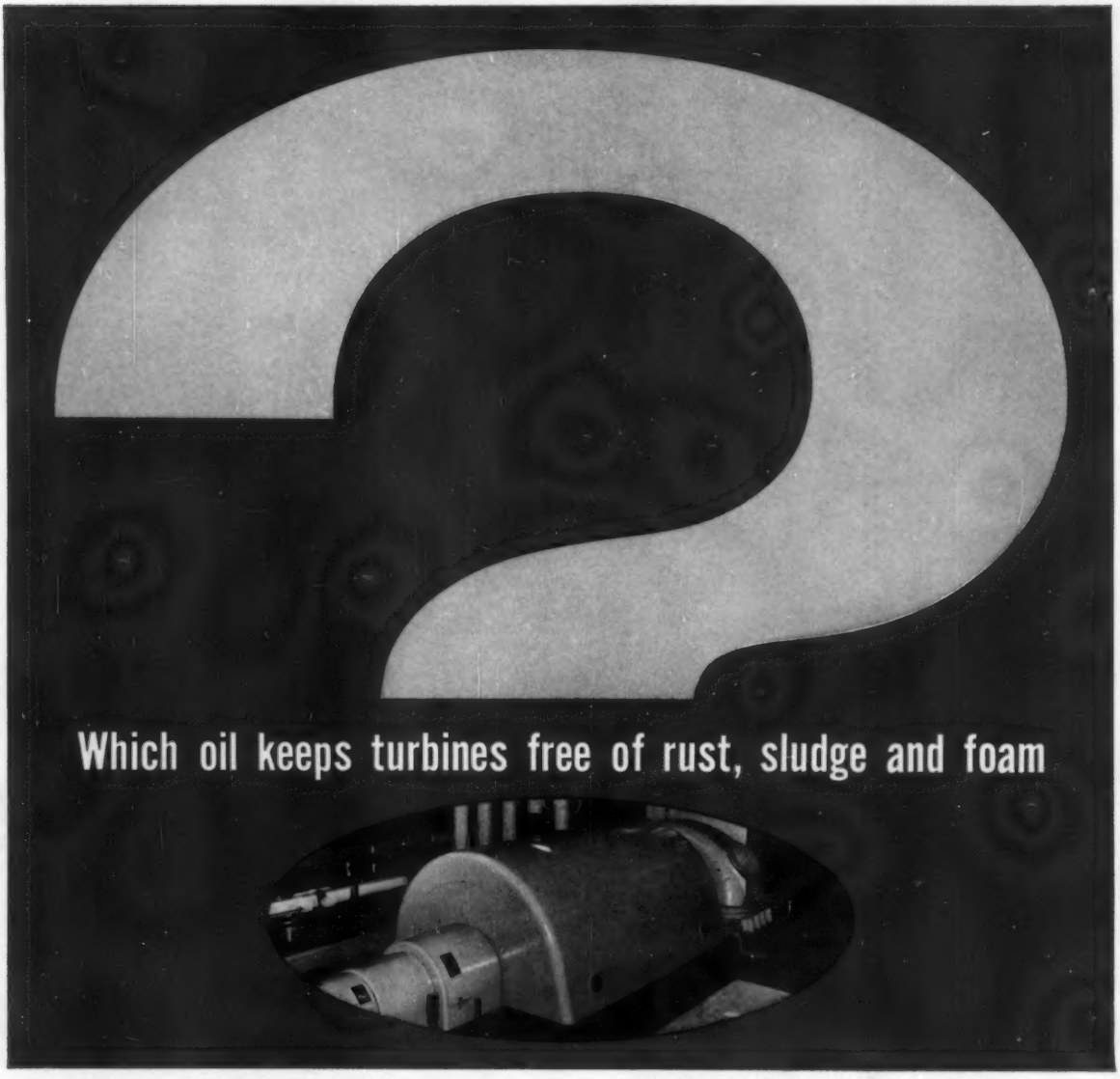

You'll find the answer in the 30- and 40-year operating records of Texaco-lubricated turbines. The oil to give you extra protection throughout an extra-long service life is *Texaco Regal Oil R&O*.

Texaco Regal Oil R&O keeps turbines running clean . . . bearing temperatures normal and governor response instantaneous. In other words, it provides your turbine with an extra margin of safety.

There is a complete line of *Texaco Regal Oils R&O* to meet every turbine builder's requirements—regardless of turbine type or size.

A Texaco Lubrication Engineer will be glad to help you select the one designed for your turbine. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO Regal Oils R&O

FOR ALL TURBINES

Electrical World

Vol. 148, No. 24 December 9, 1957

Published for 83 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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EEI survey shows December peak rate a bit faster than summer. Rate will reverse, though, next summer.....p 66

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Utilities stand to gain with an Industrial Electrification Council course that will begin next year.....p 69

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TRANSMISSION

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New structure design and bundled conductor field tested by AG&E on three 8-mile sections of 85 mile line.....p 76

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ALUMINUM-SHEATHED CABLES

...light ...strong ...smaller diameter ...easy to install and terminate

A seamless aluminum sheath over Okonite cables provides a durable, conduit-type covering of high tensile strength. Yet this aluminum sheath is easily worked with standard conduit tools. It can be bent around obstructions . . . terminated at boxes, transformers, and the like . . . trained in trays . . . or supported by conventional brackets and cable clamps. Standard fittings are available. This low-cost alternate to rigid conduit is available with virtually any Okonite insulation such as rubber, plastic or varnished cambric.

Here are some important benefits of Okonite's aluminum-sheathed cables:

Reduced diameter and lighter weight.

Impervious barrier to liquids and vapors.

Excellent flame resistance.

Costs less than regular conduit installations.

Great mechanical strength, yet easily worked.

For complete data on Okotherm-insulated (silicone rubber compound) aluminum-sheathed cable for use in high ambients up to 200C (392F), contact your Okonite representative or write for Bulletin EW 1088A, The Okonite Company, Passaic, N. J. 4742

where there's electrical power . . . there's **OKONITE CABLE**

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. . . from the publisher

Not So Tight

If somehow it seems easier these days to fill up those engineering jobs you have open, it may not be wishful thinking.

A new survey by the Engineers Joint Council, just off the press, shows the much-worried-about engineering shortage is loosening up—for industry, at least. Reasons: a downward trend in demand for engineers, and a larger (by 20%) 1957 graduating class.

The 407 companies who took part in the survey expect to fall short of their total engineering manpower needs by only 1.8% this year. Out of the total 152,437 engineers they say they will require by year's end, they expect to have 149,579 on their payrolls.

Utilities, however, will have a slightly higher deficit than industry as a whole. The 51 queried say they will need a total 12,079 in their working force by Dec. 31, expect to have 11,798—a deficit of 2.3%.

For a copy of the full report, write to The Engineers Joint Council, 29 W. 39th St, New York, N. Y. Price is $1.00 per copy. A more detailed analysis will appear in an early issue of Electrical World.

Fischer Black

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New Allis-Chalmers

Ratings of FZO

14.4 kv, 500,000 kva to
69 kv, 3,500,000 kva

A-C ALLIS-CHALMERS

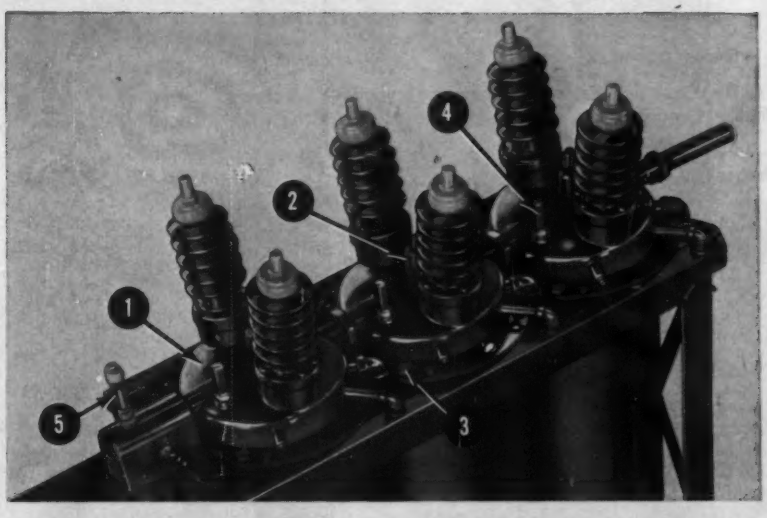
ALLIS-

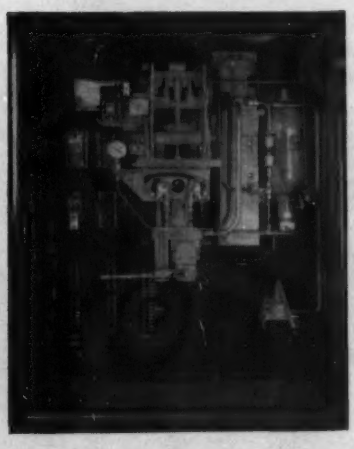
A-5256

FZO frame-type breaker

brings you these (4) features:

(1) New Top . . . including (1) self-cleaning, smooth fabricated steel top for each tank; (2) external adjustment of overtravel stop (without using feeler gauges); (3) only four bolts per tank for easy lowering; (4) high visibility float-type oil gauge and (5) ball-type position indicator visible from 360 degrees.





(2) Pneu-Draulic operator has few moving parts . . . has proved itself reliable in dozens of utilities throughout the country . . . provides full-speed emergency closing (using hand pump) even without control power.

(3) Turbo Ruptor device features tulip and bayonet contacts. These lessen mechanical impact forces through tapered design of bayonet and provide wiping action for positive contact. Multiple tulip segments eliminate contact bounce.

(4) Full Access to tanks and contacts. Access is unobstructed by frame members. In addition, lowering of tanks is simple; only four bolts hold each tank to the frame. Full tank skirt is provided on each tank to add stability when tank is on the ground.

...plus power-operated Tank Lifter

Eliminate hand cranking! Let hydraulic cylinders raise and lower tanks safely — effortlessly. This unique A-C feature is a natural extension of the *Pneu-Draulic* operator. Easily installed . . . cylinder rods slip into tank bolt holes at top of tank.

Easy to operate . . . simply open one of two valves to lower tanks — the other to raise tanks.

Safe . . . tanks will lower at predetermined speed even if hose and fittings are accidentally removed.

Lifter consists of two hydraulic cylinders and flexible hose. Hydraulic pressure is from the accumulator or pumps of the *Pneu-Draulic* operator system. If breaker doesn't have a *Pneu-Draulic* operator, a battery operated unit is available.

This is only one of many features brought about by the redesign of Allis-Chalmers frame-type breakers.

For details see Bulletin 71B8475. Contact your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

CHALMERS

Pneu-Draulic and Turbo Ruptor are Allis-Chalmers trademarks.

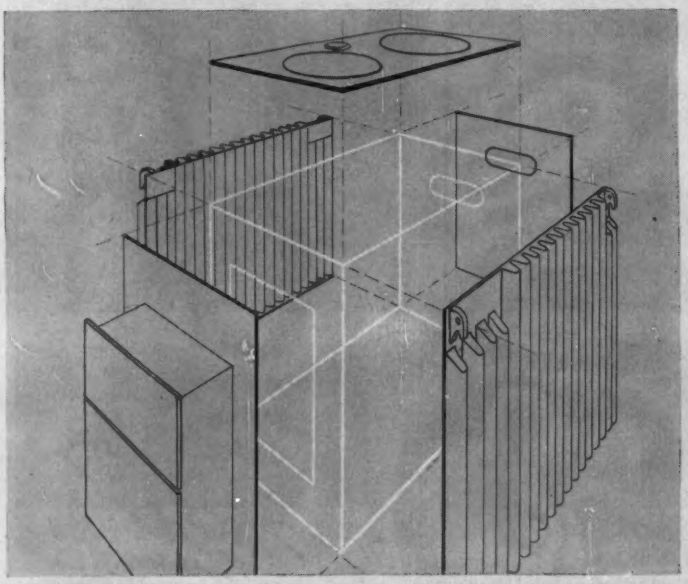
For years, Moloney has conducted research to improve the tank construction of network transformers. Several years ago, Moloney developed a practical way to corrugate heavy gauge steel plate and experimentation in corrugated tank construction was undertaken.

Extensive research eventually lead to a tank design which was mechanically strong and had a minimum of welded joints that corrosion might attack.

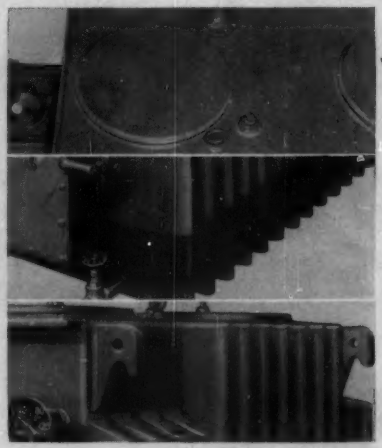
Moloney Corrugated Tank Network Transformers, subway or vault type, are available in sizes up to 1000 KVA. NEET-24

Corrugated tanks offer these advantages to users of network transformers:

- Smaller overall size of the transformers and consequently smaller vaults.
- Tanks may be cleaned from above and repainting is easier as there are no inaccessible areas.
- Vertical tank surfaces shed corrosive matter and consequently contribute to longer tank life.

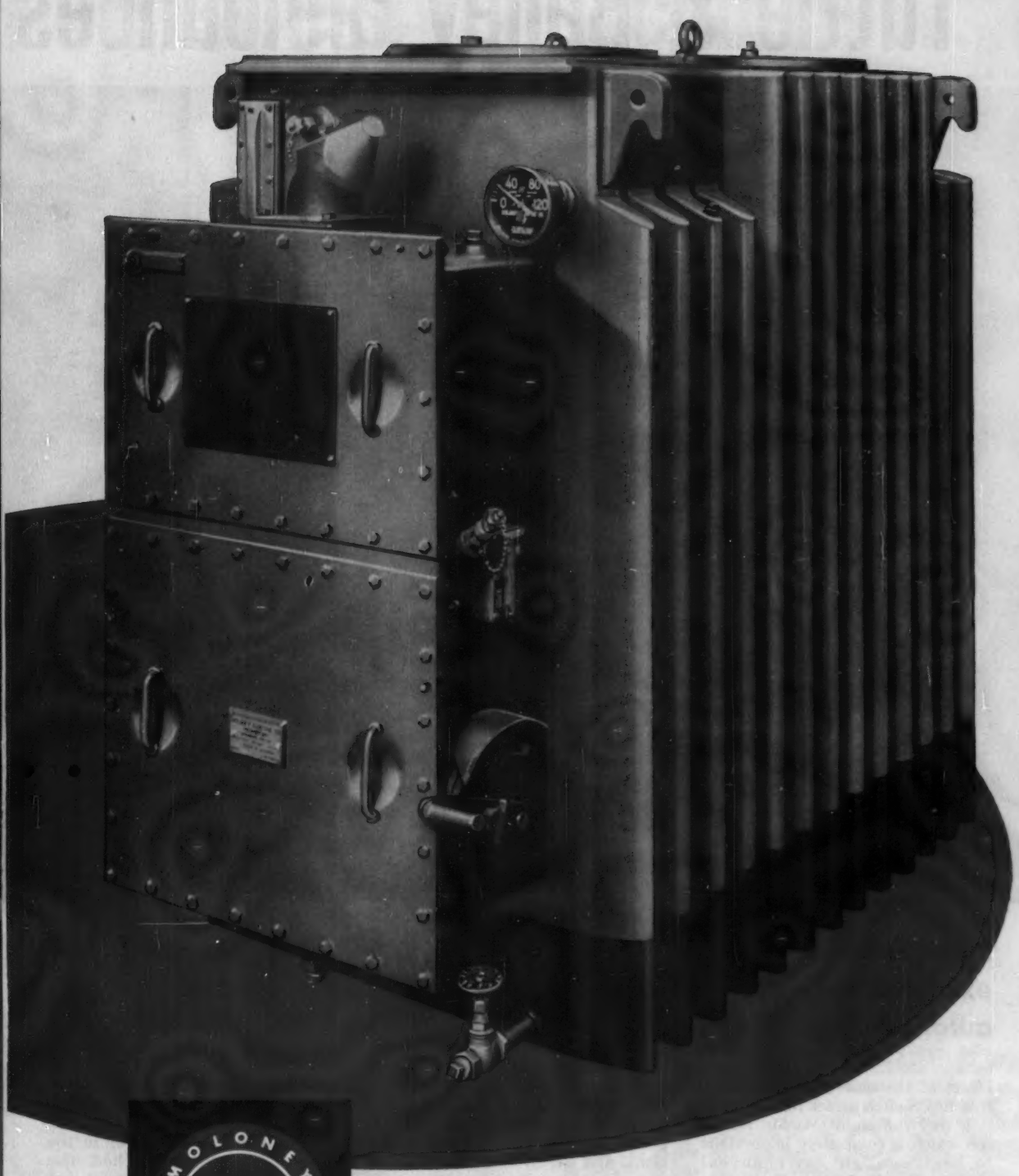


- Corrugated tank wall is made of one piece of steel. Continuous seam welds are made only at the four corners of the tank, around the low voltage throat and high voltage switch and at the junction of the tank walls and the bottom, greatly reducing the possibility of leaks.



- Tank covers and handholes are welded on, absolutely sealing the tank against the entrance of moisture.
- Undercoating of the tank base and the lower part of the tank wall gives maximum protection against rust and corrosion.
- Lifting hooks do not extend beyond the maximum measurements of the tank.

A NEAT PACKAGE . . .



MOLONEY ELECTRIC COMPANY

Manufacturers of
Transformers for Utilities, Industry, and Electronic Applications

SALES OFFICES IN ALL PRINCIPAL CITIES
FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

Tuttle & Bailey announces

No tubes or transistors!

No magnetic load relays!

No heating or drift problem!

New Tuttle & Bailey SYNCHRO SWITCH, with tiny photocell, has extraordinary stability, long life — makes possible precise automatic switching of any street lighting circuit!

Heart of the new Tuttle & Bailey Synchro Switch street light control is a tiny cadmium selenide photocell which is completely impervious to heat, sunlight, or chemical change. By eliminating these hazards, the Synchro Switch eliminates amplification losses and "drift" problems, normally associated with phototube controls.

The cell acts like a resistor in the circuit. It is connected to a voltage divider and resistance network which protects the system against *all* electrical or mechanical drift.

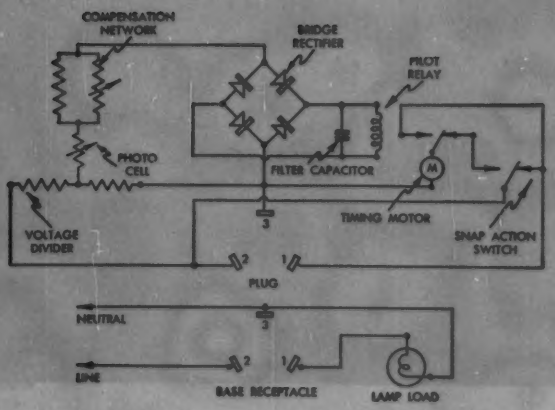
This unique feature gives the Synchro Switch extraordinary stability and accuracy, even under severe weather or operating conditions. And the Synchro Switch provides, at last, truly economical operation. It draws, on an average, less than 0.25 watts from the power line throughout an entire 24-hour operating cycle!

The unit is normally set to TURN-ON at 1.5 footcandles and OFF at 2.25 footcandles, but has a range of adjustment from 0.5 to 8.0 footcandles.

Calibration of the Synchro Switch is made by a new, extremely accurate process—developed by Tuttle & Bailey—to assure one uniform setting in the laboratory or in the field! Through this method, the Synchro Switch can be easily and precisely adjusted to TURN-ON and OFF at the exact light level specified.

Find out how the advanced Tuttle & Bailey Synchro Switch control can reduce operating, maintenance, and replacement costs for you. For complete ratings and description, call or write: Tuttle & Bailey, Cat. No. 405 & 406, New Britain, Conn.

new street light control...



Here's how the SYNCHRO SWITCH operates...

The photocell is in series with a voltage divider and compensating resistor network. In darkness, the cell's resistance increases. This reduces the amount of current passing to the resistor network. This portion of the circuit operates on AC. The resistor network supplies input voltage to a full-wave bridge rectifier. Direct current from the rectifier is filtered through a dry-type filter capacitor and is fed across the coil of a sensitive-type pilot relay. Two single-pole contacts on the relay apply power to a synchronous motor which trips a snap-action switch. This turns the lamp load on. The motor operates for only 15 seconds a day. After the lamp has been switched on (or off) power is removed from the motor by the snap-action switch.

TUTTLE & BAILEY

division of Allied Thermal Corp., New Britain, Connecticut

A quarter century of interrupter switch research . . .

produces another tool to solve your power switching problems

Basic research in the theories of arc interruption has been carried on at the Westinghouse High Power Lab since the early 30's to establish principles useful in developing our modern disconnect switches.

Latest in the line of Westinghouse interrupting switches is the quick-break arcing horn . . . to quickly and safely interrupt small loads, magnetizing or charging currents. The line is available for adding to the Type V or RL in ratings from 7.5 to 69 kv. (Unit at left is rating 69 kv.) With the positive snap action of the quick-break arcing horn, to prevent arcing, primary circuits can be safely interrupted under load without endangering personnel or equipment.

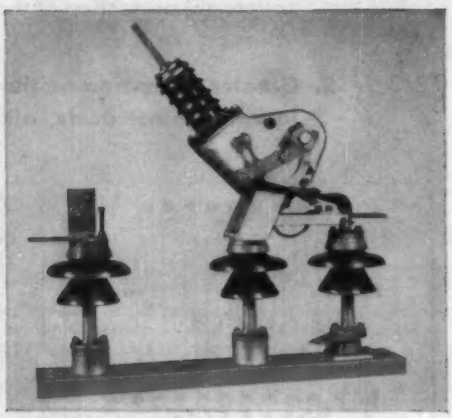
For complete details about the best air break switch to solve your circuit interruption problem, call your Westinghouse sales engineer, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania.

J-60030

YOU CAN BE SURE... IF IT'S Westinghouse

Continuing research and testing at Westinghouse has contributed much to the art of arc interruption. The VLB switch developed in 1951 introduced SF_6 to extend load break capacities to 161 kv.

Earlier research, in 1940, resulted in the design of the LCB switch with boric acid fuses utilizing the De-ion® principle . . . having ratings from 5 through 15 kv on indoor applications.



An early model air break switch Westinghouse was working with in the 1930's to improve the arc extinguishing techniques known at the time . . . one result: high pressure contact jaws.

IF IT CARRIES CURRENT, KW CARRIES IT!

NEW LAYTEX-RESIN INSULATION GIVES KW CONTROL CABLES FINEST PROTECTION MADE!

Now with new "Kaiser Master" Control Cables, KW brings you *Laytex®Resin*... most significant advance in control cable insulation since the introduction of Laytex insulation in 1932.

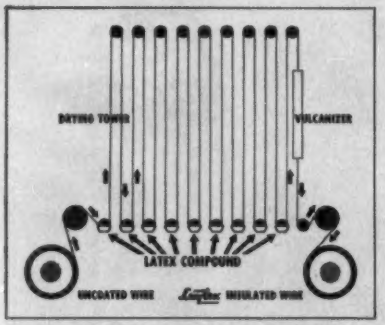
In Laytex-Resin, the synthetic resin conductor covering becomes an integral part of the insulation. The resin is applied in the same dip process as the Laytex, and is fused right into the rubber. This eliminates the need for protective braid covers, which in turn permits greatly reduced cable diameters!

In addition to smaller diameter and resulting lighter weight, Laytex-Resin cables offer all these other advantages over cables with braided conductors:

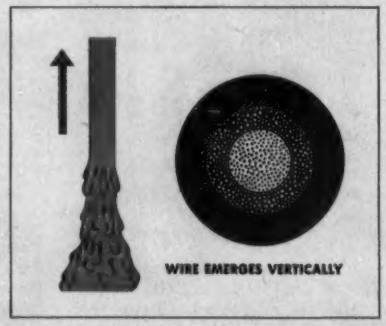
1. **More complete (100 per cent coverage) protection of the insulation.**
2. **Greater protection of the insulation against acids, alkalies, flame, fungus, moisture, oil, ozone and light checking.**
3. **Cover does not fray or wick moisture.**
4. **Splicing and taping made easier.**
5. **Smoother conductor surface.**
6. **More attractive colors (including stripes).**

For a record of dependability in municipalities all over America, KW Laytex-Resin Control Cables are backed up by twenty-five years of perfect service given by their predecessors, Laytex insulated control cables.

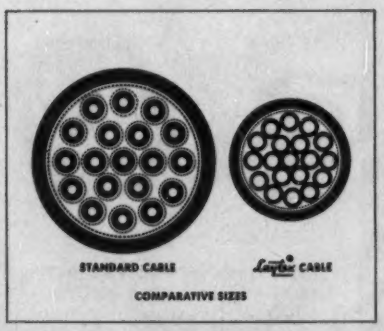
KW "Kaiser Master" Control Cables more than meet the standards set up by I.M.S.A. Specifications No. 16. These cables have tinned or alloy-coated solid copper conductors in accordance with A.S.T.M. requirements. The choice of an overall protective covering for these cables is determined by the customer and is governed by conditions of installation and use.



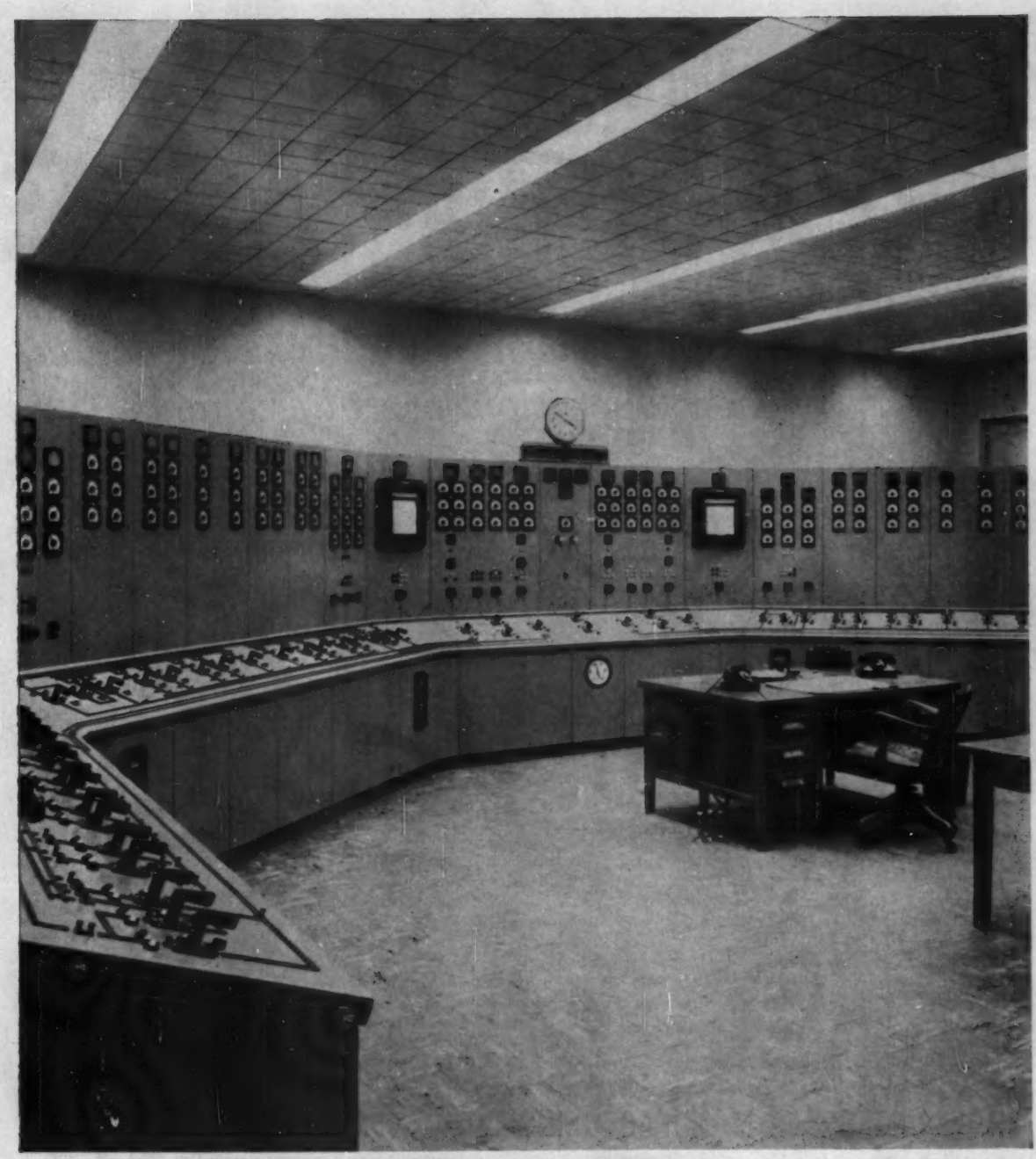
Laytex-Resin is applied to each individual conductor by the dip process diagrammed above. Because the rubber is applied in unmilled form and the resin is bonded directly to it, Laytex-Resin insulation has no "grain"—its physical properties are *uniform in all directions.*



In the dip process, the conductor emerges vertically from the liquid compound, forming the compound in uniform layers around the conductor. This results in a perfectly centered conductor and permits an insulation with thinner walls than are possible with extruded rubber.



Because the wall thickness required with Laytex-Resin is only one-third to one-half that required for conventional insulations, and because braided conductor covers are eliminated entirely, Laytex-Resin makes possible *more wires per conduit* . . . plus reduced weight and increased flexibility.



The properties and the performance demonstrated by KW Laytex and Laytex-Resin Control Cables all add up to unequaled *Dependability*. These cables may be installed (1) in conduits, ducts or trays, (2) as aerial cable on a suitable messenger, or (3) buried in the ground.

For immediate service, or for further information and samples, call the Kaiser Aluminum sales office or the KW distributor listed in your telephone directory. Kaiser Aluminum & Chemical Sales, Inc., *Executive Office,* Kaiser Bldg., Oakland 12, Calif.; *General Sales Office,* Palmolive Bldg., Chicago 11, Ill.

KAISER ALUMINUM

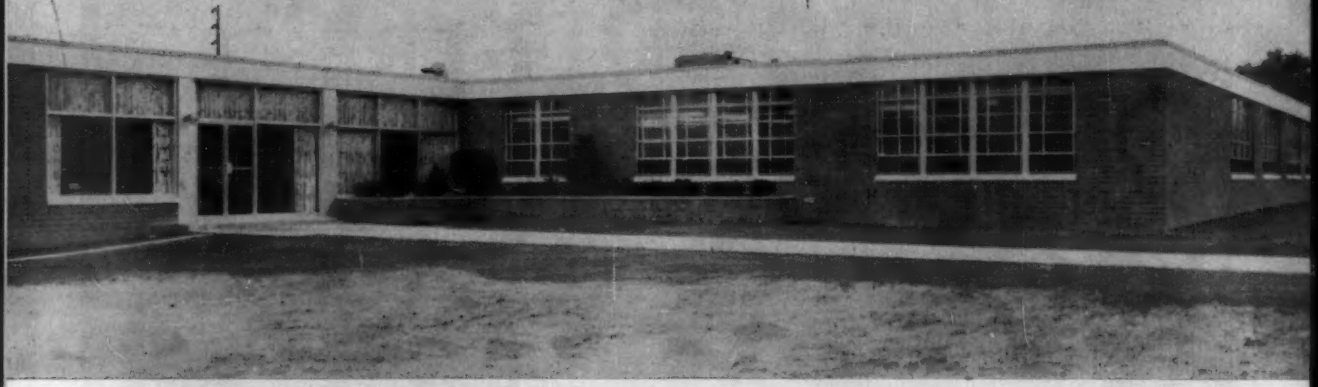
THE BRIGHT STAR OF METALS

SEE "MAVERICK," • SUNDAY EVENINGS, ABC-TV NETWORK • CONSULT YOUR LOCAL TV LISTING

In this new AMERICAN METER COMPANY plant...

UPTEGRAFF TRANSFORMERS

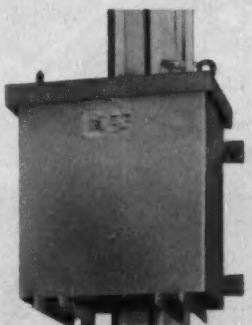
provide: *dependable design, quality construction, efficient operation, overall economy*



The American Meter Company has ten plants throughout the United States where pressure-measuring meters for water and gas are manufactured. The above new plant is a typical example of how Uptegraff transformers efficiently and with maintenance-free long life serve important industries as well as utilities.

The transformers range from 1000-kva outdoor power transformers, seen on the next page, to the indoor dry-type transformers, below, both overhead and floor mounted. The main outside bank of Uptegraff transformers connects to Philadelphia Electric Company's 33-kv lines. This high voltage is permitted for the use of the industrial company. It reflects the high degree of confidence of the American Meter Company in the design and construction of Uptegraff transformers.

Uptegraff makes a complete line of Power, Load Center, Distribution—overhead and station type, Network, Instrument, and Specialty transformers. Write for Engineering Data *today*.



A typical Uptegraff indoor specialty transformer for overhead mounting. Made by the Terra Alta Division, this dry-type transformer is rated at 30 kva.

R. E. UPTEGRAFF MANUFACTURING CO.

Scottdale, Pennsylvania

Architects and Engineers
George M. Ewing Co.
Philadelphia, Pa.

Consulting Engineer
Louis W. Moxey III
Philadelphia, Pa.

General Contractors
Nason and Cullen, Inc.
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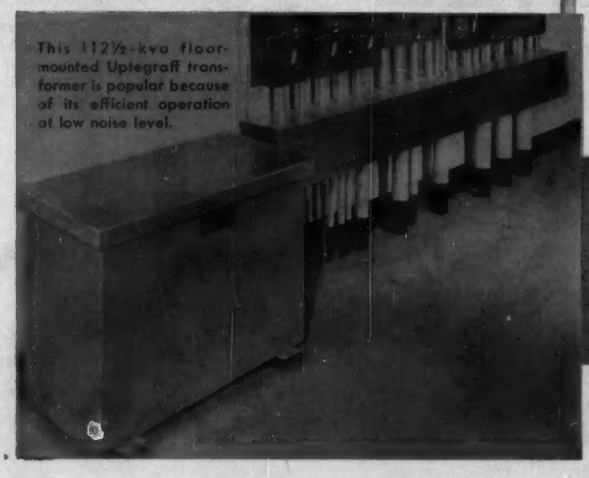
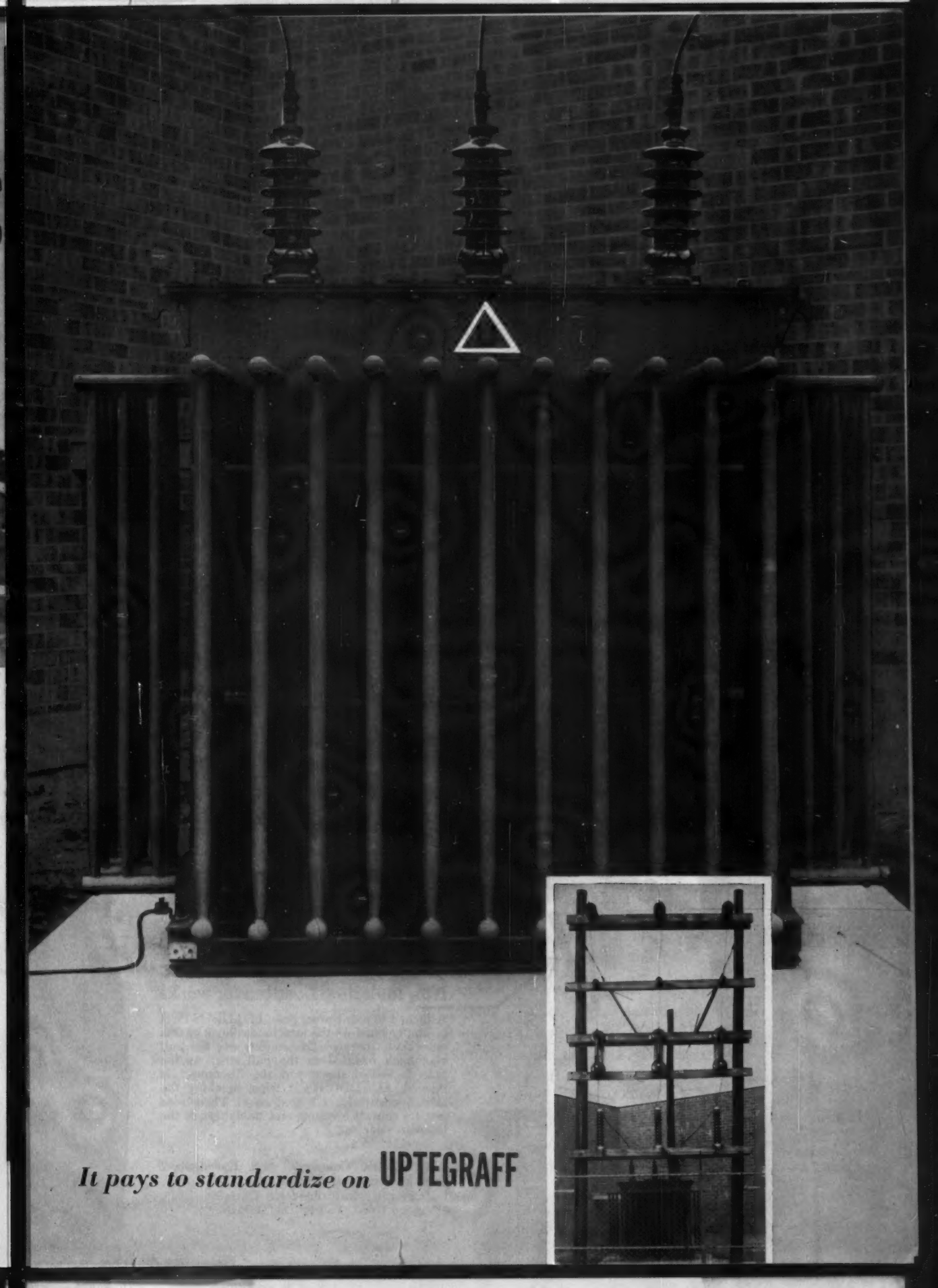
Electrical Contractor
Seaboard Electric Co.
Philadelphia, Pa.



This 112½-kva floor-mounted Uptegraff transformer is popular because of its efficient operation at low noise level.



It pays to standardize on **UPTEGRAFF**

Note this Nameplate Carefully—

TOOL OPERATED DISCONNECT

CAT. NO:	4752	KV, NOMINAL:	15
KV, MAX. DES:	15	KV, IMP. WITH:	95
AMP, CONT:	400	AMP, MOM:	20000

This is an S&C Tool Operated Disconnect. Used with S&C's Loadbuster, it can switch the circuit under any condition except short circuit—without external arcing.

U S PATENTS PENDING

S&C ELECTRIC COMPANY

CHICAGO

Made in U. S. A. G-3448

It means—

1. universal low cost load switching throughout your distribution system by use of LOADBUSTER®, the portable loadbreak tool; for loads up to 400 amperes and with system voltages through 14.4 kv;

2. station-type disconnect performance at distribution disconnect prices;

3. S&C stands behind this disconnect's performance with full published short-time ratings and insulation values—values which cannot be matched in the distribution field;

4. an inexpensive device for duties normally handled by group-operated disconnects, station-type stick operated disconnects, and conventional load interrupters.

Now look how Loadbuster works

Attached to a universal pole, LOADBUSTER is simply hung on the attachment hook of this new Tool Operated Disconnect, and the pull ring hook inserted in the pull ring. As the pole is pulled downward the disconnect is opened, LOADBUSTER trips, breaking the circuit positively. It's that easy! There's no arc, no contact burning, and no danger to the lineman operator.

S&C Electric Company, 4421 Ravenswood Avenue, Chicago 40, Illinois.
In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario.

NEWS-SCOPE

FUTURE NEWS ▶ **Plans for greater federal subsidization** of building and operating nuclear power plants may emerge from last week's top level talks in Washington on civilian atomic power program. Aim: To speed up the program which is lagging because of higher than anticipated costs, lack of economic incentive, and realization that atomic power won't be economically competitive with conventional fuels for a few years.

Federal power proponents are taking a new line: That the U.S., in light of Russian technological advances, must more than ever support water resources development to help build up its national economy to be in position to support greater military effort. Major Gen E. C. Itschner, chief of U.S. Army Engineers, took this tack last week in talk to Mississippi Flood Control Assn.

Watch for new record peaks this winter. At least three utility companies should pass the 4-million-kw mark.

LATE NEWS ▶ **BPA cuts interruptible load to 13 electro-process plants 12/1** as Columbia River system stream flows continue below normal. Natural flows at Grand Coulee and Bonneville Dams, week ending Nov. 21, were 32,900 and 79,000 sec ft. Average year flows are 42,000 and 91,700.

Scientists involved in the Windscale reactor accident will protest to British government about "monstrous inaccuracies" in official report. They charge the pile physicist blamed for starting the disaster due to judgment error was not present during the accident: the cause was not properly accounted for; and the committee didn't know enough about uranium reactors to determine the cause.

Shifting Thanksgiving holiday hits electric output. With national holiday one week later this year, output dropped 3.8%. Reasons: Retail business firms lost important shopping day and factories shifted closing hours. Jan. 7, 1950, when a similar situation arose, was last time comparisons went to a minus figure.

Obituary . . . William H. Onken, Jr, former editor in chief of Electrical World and noted electrical engineer and consultant, died last week at his home in Brooklyn Heights, N. Y. He was 82. Onken, an authority on hydroelectric power, headed EW from 1917 to 1928.

Management promotions . . . Pennsylvania P&L elevates Jack Busby to president and names Charles Oakes board chairman . . . H. M. Parker rises to VP-finance and secretary, Central Illinois PS . . . New England Electric System promotes R. F. Krause to president, New England Power; C. W. Jones, to VP, NEP; A. V. Coleman to president, NEP Service; R. E. Nock to VP of NEES; and E. G. Twohey to VP-general manager, Narragansett Electric . . . At Southern California Electric, Bruce Renwick became VP-senior counsel; R. E. Woodbury, general counsel; and T. M. McDaniel, Jr, VP.

ELECTRICAL WEEK

A TWO-MINUTE

ATOMIC PROGRESS ▶ **Satellite hysteria may mislead Congress** into plunging the government into a crash atomic power program which might scuttle U.S. leadership, warns Connecticut L&P's Sherman R. Knapp **(p 70)** . . . Northern States Power Co contracts with AEC for 66-Mw, $28-million nuclear plant . . . Shippingport goes critical **(p 65)**.

WASHINGTON ▶ **What's Dick Nixon like?** EW's Washington correspondent paints a significant word-portrait of the Vice-President, the logical person to help Ike carry out his "partnership" philosophy **(p 64)**.

EVENTS ▶ **The industry's outlook remains good, reports EEI's** 22nd Semi-Annual Electric Power Survey. This year's winter peak possibly may show more growth than this summer's peak, but summer peak growth definitely is predicted to be faster for the next three years. By 1960, summer peak will represent about 97.5% of the nation's winter peak. Future capability looks good, gross margins are improving, and construction is on schedule **(p 66)**. Manufacturers' scheduled shipments next year will top all previous records, the survey shows. A new high of 52,928 Mw are slated for operation between Jan. 1, 1957, through 1960 and later. Average size of units over 100 Mw is 175 Mw. Units of 250 Mw sizes and larger now make up 24% of the industry's expansion program **(p 108)**.

GENERATION ▶ **The new-fangled canned motor,** developed to handle radioactive coolants in nuclear reactors, has won a place for itself in standard steam stations' boiler circulation systems. Vepco's J. R. Slack reports that his company put the motor through rigorous tests, suggesting improvements after inspections. Finally an improved motor was pronounced "a good piece of equipment." In addition to quiet performance, it requires no external glands and associated water-injection equipment. It improves station heat rate about 15 Btu, but its efficiency is off a little **(p 78)**.

TRANSMISSION ▶ **If you have a transmission line running over hills,** you may have pondered many an hour trying to determine the minimum class of tower to use here and there. You know that cold weather changes tower loading, and you know that improperly specified towers and sags invite outages. To complicate matters, line angles may make it easier for an icy wind to whip taut conductors about, perhaps to their detriment. H. B. White, transmission engineer for Aluminum Co of Canada, describes here an easy, fast, nomographic method for figuring sags. All you need to know are the "weight span" and the "wind span" at maximum sags **(p 73)**.

Little quiz on EHV: Which is better—bundled conductor or expanded conductor? Two ground wires or one to a tower? The standard tower or a squattier tower? AG&E Transmission Engineer E. S. Zobel says his company doesn't know the answers to those questions.

That's why the company is experimenting with a 24-mile strip of a 345-kv line linking Muskingum and Tidd plants. In addition, researchers hope to compare RI levels of bundled conductor in delta and vertical circuit patterns with RI levels of single 1.75-in. expanded ACSR in the standard vertical configuration. Slack describes more scientific sleuthing on (p 76).

HEATING & COOLING ▶ **To win employee enthusiasm for electric house heating,** Arkansas P&L offers $125 to any employee who installs a heat pump of 2-ton capacity in his house. Or if the employee prefers resistance heating, the company offers $10 per kw, provided the whole house is heated electrically. In addition, employees get the benefit of AP&L's new heat rate of 1.2¢ which, since its creation, has stimulated "scores of new electric heating jobs" (p 90).

MANAGEMENT ▶ **Take the guesswork out of planning for tomorrow.** You can find substantial answers to some of your more intriguing problems through residential load studies. Vepco Vice President T. D. Fulford and Ebasco Consultant T. L. Sharkey tell how Vepco learned that its current rates will be adequate when applied to big domestic loads of the future, and why Vepco should promote space heat. Furthermore, there were some interesting offshoots of the study (p 79).

FINANCE ▶ **Central Maine Power's petition for a $2.3 million rate increase** goes back to Public Utilities Commission following a state Supreme Court ruling on six points. The court disallowed normalized taxes, fuel costs, merchandise department losses, and setting rate of return. But it sustained the company on additional wage costs and on promotional expenses disallowed in part by the commission (p 117).

The decade ending last year has seen business boom in Kansas, has seen Kansas G&E's revenues almost triple to $29.9 million with net income climbing 19.7%, and earnings per share rising 84% or $1.07 per share (p 118).

PEOPLE ▶ **Cincinnati G&E has named Ernest S. Fields** president and chief executive officer, and William H. Zimmer as executive vice president and treasurer . . . Detroit Edison promotes four to vice-presidential posts: Arthur S. Griswold, Donald F. Kigar, Sylvester F. Leahy, and Chester F. Ogden (p 120).

MANUFACTURERS ▶ **An original design to make cross-compound units compact** is under test at Allis-Chalmers Mfg Co's West Allis steam turbine assembly and test pit (p 112).

NEW EQUIPMENT ▶ **Oil cutout assembly** provides switching and protection for heavy industrial branch circuits. Assemblies are metal-enclosed. One sectional assembly handles two branch circuits (p 99).

ENGINEERING TRENDS

Feeder voltage and outage records will help to reconcile industrial customer toward a common agreement on relay coordination and protection. Automated plants and continuous process lines will accelerate the industrial customer's interest in voltage dips, interruption, and circuit outages.

Transformer noise level at a residence 100 ft away can be cut 30 to 40 db by completely enclosing the transformer in masonry walls and roof. Maximum attenuation may require that radiators be removed from the tank and mounted separately on their own foundation, using flexible couplings to convey oil to and from the tank without transmitting the noise. Such treatment helps to solve the ventilation problem which usually requires special attention with any total enclosure.

Inexpensive miniature batteries made with solid wax electrolytes are being investigated by National Bureau of Standards. They appear to provide fairly high voltage with extremely low current and small size. These batteries could probably be used to maintain a change on a capacitor or supply grid-bias voltage for electron tubes.

Chlorides bond nonferrous metals by ion exchange according to Electronics. A combination of chlorides react instantly on metals heated to 810F, eliminating surface oxides while causing the metals to flow together. Joints produced in aluminum are stronger than the metal.

Drawings to be used for cutting patterns can be made more accurately on paper-thin aluminum than on paper, which is changed dimensionally by temperature and humidity variations.

Pouring of concrete beams and columns in freezing weather can be safeguarded by energized low-voltage soil-heating cable woven into the reinforcing. The cable is cut off flush after concrete hardens. According to "Journal IEE" temperature of the poured concrete has been elevated several degrees for the required 24 hours with about 3-kwhr consumption per column.

FROM EDITORS IN THE FIELD

Safe, economical distribution transformer installations have been designed by Central Illinois Public Service Co by using flexible polyethylene tubing to train the primaries from cutout to bushing.

Keeping boiler in operation for fast restart of the turbine is the reason given by a group of Northeastern utilities for including auxiliary transfer facilities in their larger steam power plants.

for the facts that prove the value of O-B station-type insulators

Station-type insulators are standardized. That makes them all alike--some think!

Your own experience doesn't bear this out, we'll wager. Some last longer than others. Since they all cost about the same, this simply means some are worth more than others. Standards don't tell *all the story.*

O-B can make some fancy claims about its insulators, but there's a better way of bringing the story home to you. It would be unusual if there weren't hundreds, maybe thousands, of O-B station insulators on your system. Look-up the record--*your record*--of *our* product.

The facts are in your file, right now, in your own language, on your own terms. They will prove the point that no standard applies to getting your money's worth!

And you'll find it pays to specify O-B insulation for your stations.

OHIO BRASS COMPANY MANSFIELD, OHIO

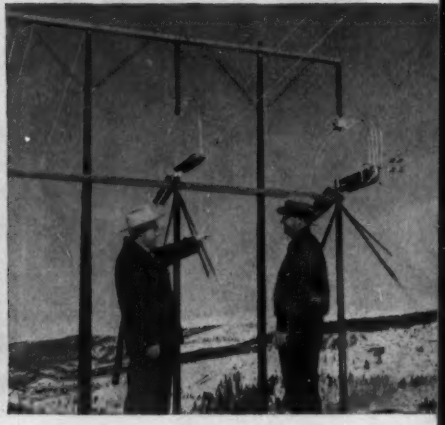
Ohio Brass

4797-H

Alcoa Field Advisors Help You Speed

Operation of new 12A lightweight Alcoa Compressor is explained by field advisor Ralph Huston (left) while making a call in the field.

On the spot to check stringing of Alcoa ACSR, Alcoa field advisor Bill Rice (left) first discusses the installation with the job foreman.



Sound, helpful advice is Alcoa field advisor Jim Sunderland's (left) stock in trade. Stringing crews welcome his solid experience on any job.

Construction, Reduce Line Costs

If you're talking transmission, distribution or substations . . . Alcoa field advisors are available to help you in three important ways.

INSTALLATION HELP . . . at the job site . . . to advise construction crews on the correct application of conductors, accessories and tools . . . to help solve special problems arising from terrain or type of erection equipment.

CONSULTATION . . . In the design stage, their advice on construction methods and equipment for installing Alcoa® Conductors and Accessories can be invaluable.

PRODUCT IMPROVEMENTS . . . From their detailed reports, written and passed on to both customers and Alcoa engineers, they aid in the development of even better aluminum conductors and accessories.

To bring you this extra service . . . at no extra cost . . . Alcoa has located field advisors at strategic points throughout the United States.

Each Alcoa field advisor, before he can be considered for appointment, has had many years of experience in conductor installation and maintenance. Before being assigned to his own territory, the new advisor spends several months with other Alcoa advisors to find out firsthand how he can be of greatest service to utilities and contractors. Later, frequent refresher courses keep him constantly up to date.

If you don't already know him, you'll find that your Alcoa field advisor is a competent, pleasant, helpful man . . . full of money-saving suggestions about stringing and sagging, welding aluminum or any of a host of important considerations in modern conductor installation. Just specify Alcoa Conductors and Accessories for your next installation and tell the Alcoa salesman you'd like the field advisor to drop around. You'll find him sincerely interested in your problems . . . and well qualified to advise you on them.

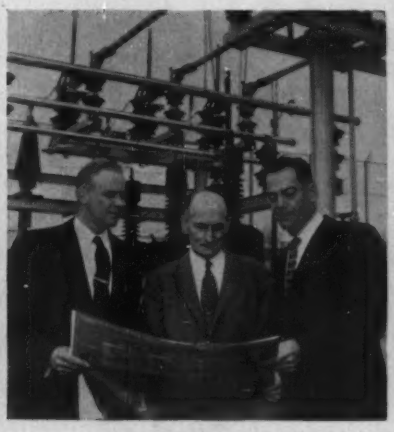
◀ On a rugged mountainside, Alcoa field advisor Shorty Lowe (left) makes a few suggestions on tackling the tough right of way that lies ahead.

ALCOA ALUMINUM
ELECTRICAL CONDUCTORS AND ACCESSORIES
ALUMINUM COMPANY OF AMERICA

Your Guide to the Best in Aluminum Value

NEW! "ALCOA THEATRE"
Exciting Adventure
Alternate Monday Evenings

Field advisor Bill Colegrove spends a day checking up on some Alcoa ACSR, newly installed by a Midwest utility.



At a utility substation, field advisor Hank Meece (right) discusses the proposed addition of some new aluminum tubular bus.

Snowshoes are standard equipment for field advisor Bob Hyde (right) as he inspects Alcoa ACSR covered with frozen snow.

NEW HUSTLE FOR '58 . . . CHEVROLET LIGHT- AND MEDIUM-DUTY HAULERS

More horsepower . . . more staying power in V8's and 6's!

New Chevrolet light-duty Apache and medium-duty Viking models bring you V8's and 6's that deliver more horsepower, more economical and dependable hauling for the toughest jobs you've got!

There's new standard power in every light-duty model . . . a more powerful (145 h.p.!) edition of the engine most famous for economy and dependability, the rugged Thriftmaster 6. And the optional (extra-cost) Trademaster V8 is *all new*, the most highly powered light-duty truck engine in Chevrolet history! It's ready to go to work with 160 h.p., 283 cubic inches of displacement, short-stroke efficiency and weight-saving compactness!

Chevy for '58 is here with new medium-duty power, too! Standard in Series 50 L.C.F. models is a new version of the Heavy-Duty Taskmaster V8, with 160 h.p. for fleet hauling and new durability features such as Stellite-faced exhaust valves and induction-hardened exhaust valve seats. And standard in Series 60 models is the time-proved Jobmaster 6 with more power than ever—150 h.p.—and a host of new features that mean more economy and dependability on jobs that work a truck hard. See your Chevrolet dealer and *save* with Chevy's new brand of hustle! . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

Latest editions of the "Big Wheel" in trucks

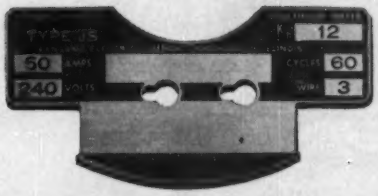
NEW CHEVROLET TASK·FORCE 58 TRUCKS CHEVROLET

Sangamo Class 200 Meters

PROVED by 17 years of performance

With singlephase residential loads growing... with more and more 200 ampere service entrance equipment being installed every day, attention is being drawn to Class 200 Singlephase Meters. Yet the development of 200 ampere meters is nothing new. Sangamo singlephase meters with accurate 200 ampere capacity have been in use for 17 years!

THE NAMEPLATES TELL THE STORY...



IN 1940, Sangamo introduced the Type J Meter which pioneered modern singlephase meter design. The 50 amp J Meter gave excellent curves up to loads of 200 amperes. These meters have been on power company lines for 17 years.

IN 1955, Sangamo presented the J2 Meter—the first standard extended range meter in the industry. The 50 amp J2 Meter offered straight line accuracy up to 200 amperes with only 18 starting watts. These 200 ampere capacity meters are on your lines today.

NOW Sangamo offers its Class 200, 30 ampere J2S Meter at the same price as Class 100 Meters—with proven accuracy to 200 amperes, slow disk speed, high starting torque, low starting watts. Choose this *proven* Class 200 Meter to protect your investment in metering.

NOW...THEY'RE GUARANTEED FOR LIFE!

The electrical and mechanical stability of Sangamo Watthour Meters is so great that an unprecedented lifetime guarantee covering materials, workmanship and bearing systems—is offered on all new singlephase and polyphase meters using Sangamo's ball and jewel bearing system.

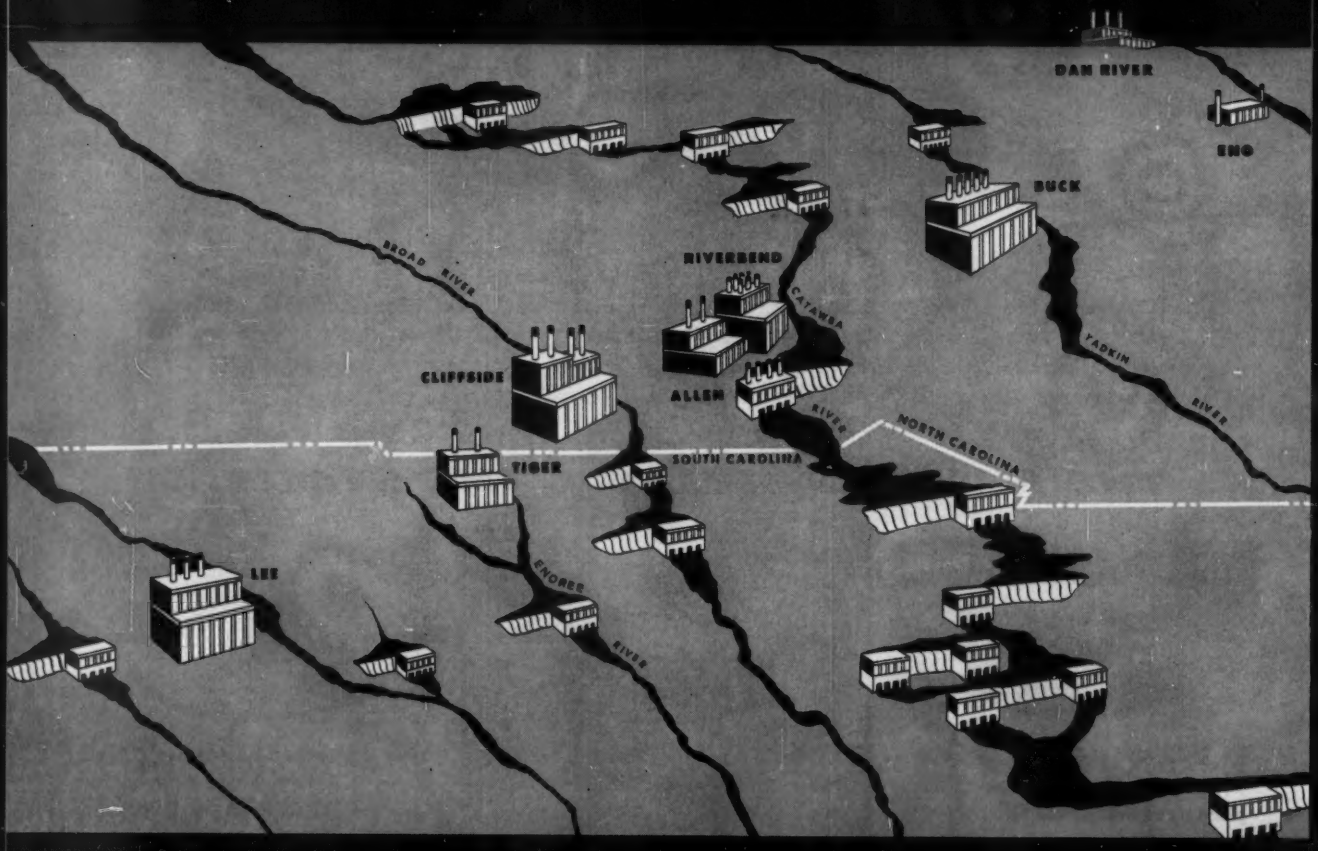
LIVE BETTER ELECTRICALLY

SANGAMO

ELECTRIC COMPANY *Springfield, Illinois*

JM57-10

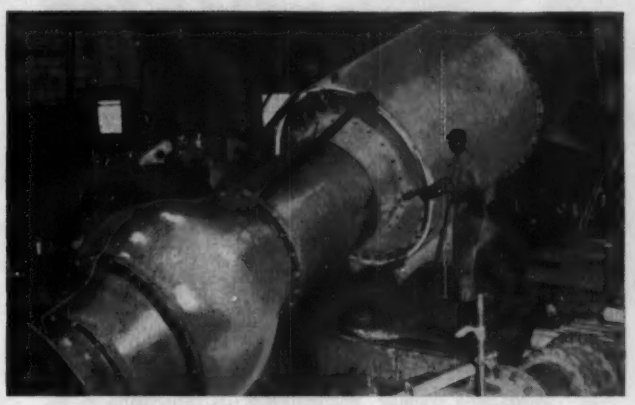
Still more power for DUKE POWER...
and the fast-growing Southern economy



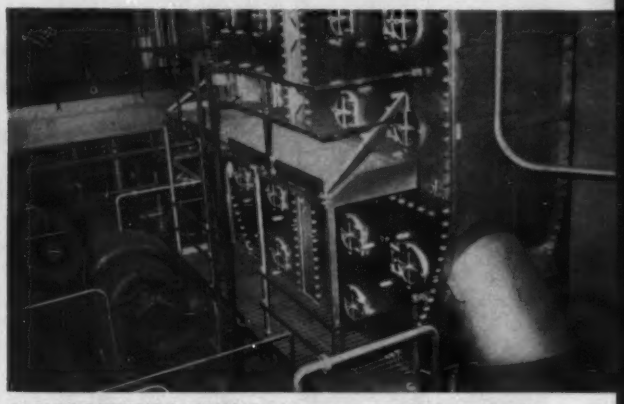
1,844,300 sq. ft. of C. H. Wheeler Surface Condensers are in use now or on order in the Duke Power System:

Station	No. of Condensers	Total Sq. Ft. Condensing Surface
ALLEN	4	530,000
BUCK	5	246,300
CLIFFSIDE	4	163,000
DAN RIVER	3	195,000
LEE	3	240,000
RIVERBEND	7	470,000
	26	1,844,300

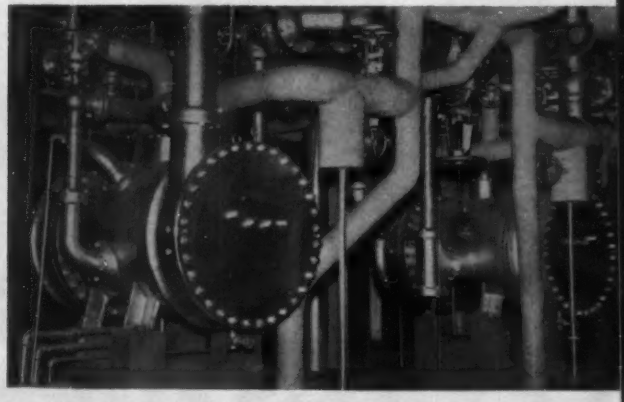
It's one of the south's greatest private power expansion programs—and C.H. Wheeler of Philadelphia is playing a leading part in it. To date, Wheeler has installed or is building 26 Dual Bank Surface Condensers, 5 Low Level Jet Condensers and a vast quantity of other power plant equipment. On the left is the story in tabular and geographic form; on this page are typical installation photographs of Wheeler equipment at Duke.



50-TON CIRCULATOR is one of 2 such pumps at Allen Plant Unit No. 1. It's a 48" x 54" Pull-Out Type Vertical Mixed Flow Pump. Capacity is 46,000 gpm. Two more of these pumps are being installed at Allen Plant Unit No. 2. The Allen Plant is the first plant in the Duke Power System to use vertical condensate pumps and circulating water pumps made by Wheeler.



AT DUKE POWER'S BUCK STATION are two C.H. Wheeler Dual Bank Surface Condensers with 75,000 sq. ft. of cooling area each. Wheeler Circulating Water Pumps are also in service at this Spencer, North Carolina Station. Other Surface Condensers at the Buck Station range in condensing area from 5000 sq. ft. (a house turbine unit) to 60,000 sq. ft.



C.H. WHEELER'S TWO-STAGE TUBEJET® Air Ejector (above) shown at Duke Power's Buck Station. These same type units have been used successfully at other power generating plants for over 30 years, with only routine maintenance. First cost and installation cost are low, installation is fast and operation simple.

ONE OF TWO 7-STAGE SPLIT CYCLE 18" x 10" Vertical Condensate Pumps (left) for Duke Power's Allen Plant Unit No. 1 ready for test. Each unit is rated at 2000 gpm against a 620-ft. total dynamic head at 880 rpm. The first three stages operate as a unit at 225-ft. head; the other four stages of each Condensate Pump operate as a booster pump at head of 395 ft.

C. H. Wheeler Mfg. Co.

19TH & LEHIGH AVENUE Philadelphia 32, Pennsylvania

Steam Condensers

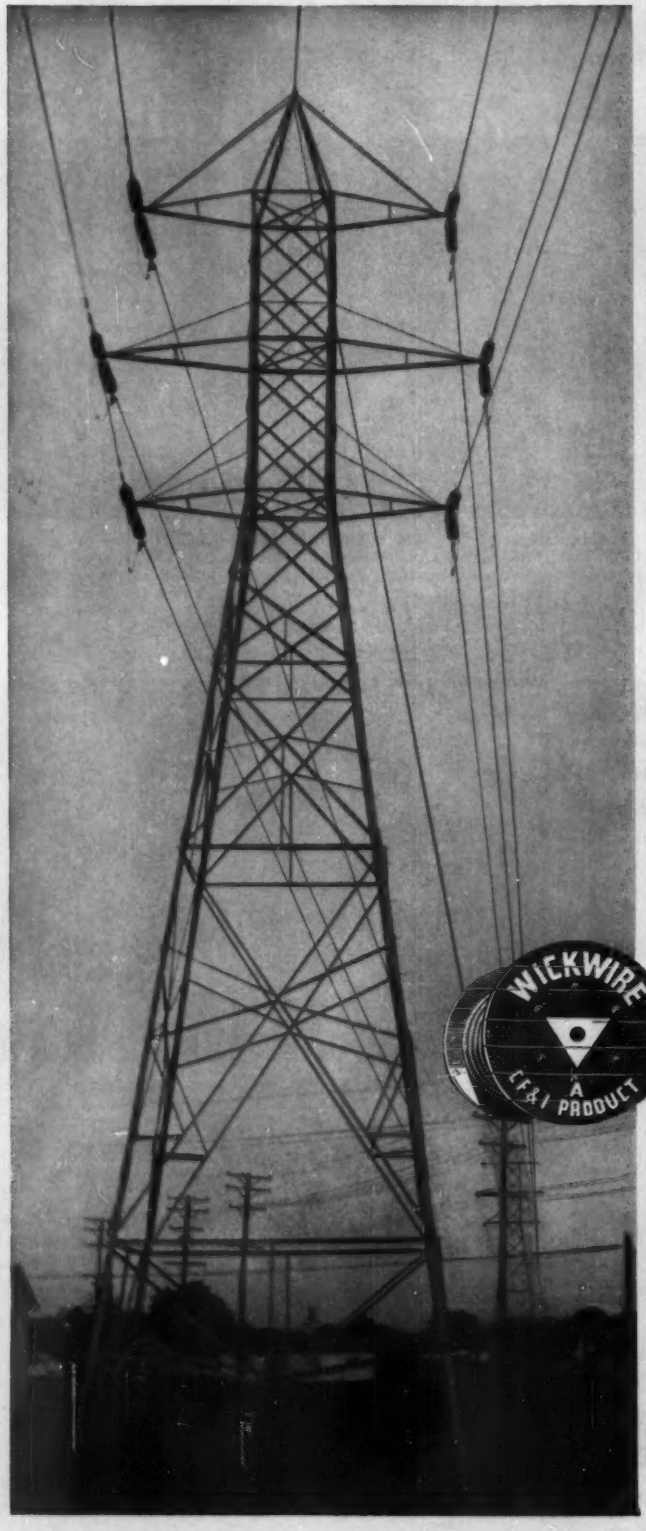
Vacuum Equipment

Centrifugal, Axial & Mixed Flow Pumps

Marine Auxiliary Machinery

Nuclear Products

CF&I GALVANIZED STEEL STRAND



for guy, messenger and overhead ground wire . . . quickly available from both eastern and western plants

No matter what part of America you're in, CF&I can quickly supply your needs for top-quality, guy, messenger and overhead ground wire. That's because three- and seven-wire CF&I Galvanized Steel Strand is made at both Buffalo, N. Y., and Pueblo, Colo.—a combination of plant sites that's ideal for speedy, nationwide distribution.

What's more, you can be sure of the quality of CF&I Galvanized Steel Strand because every phase of its production is supervised by the manufacturers of world-renowned Wickwire Wire Rope and Wire Rope Slings.

Next time you need strand—whether it's to your own specifications or to ASTM Specifications A-122 or A-363—be sure you explore the many advantages offered by CF&I Galvanized Steel Strand. Better still, contact your nearby CF&I representative today.

GALVANIZED STEEL STRAND

THE COLORADO FUEL AND IRON CORPORATION

Albuquerque • Amarillo • Atlanta • Billings • Boise
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An ounce of scientific prevention

Like the dramatic progress in medical science, modern tree care bears little resemblance to the crude methods of only fifty years ago. No longer is it enough to repair damage—to cut away a limb that has died. Today, as always, we seek the answer "Why"—the cause of the damage or disease and apply every modern technique and curative treatment. Only in this way can America's rich heritage of shade trees be preserved.

Scientific tree care is available to you through your local Bartlett representative, a highly skilled technician backed by the knowledge and experience of the Bartlett Tree Research Laboratories. If you have trees which you value, it will pay you to consult him before you need him. No one knows better than a Bartlett client, that an ounce of scientific prevention is worth many many pounds of cure.

REMEMBER

Our long experience in working with both utilities and the public is your assurance of dependable work and good customer relations.

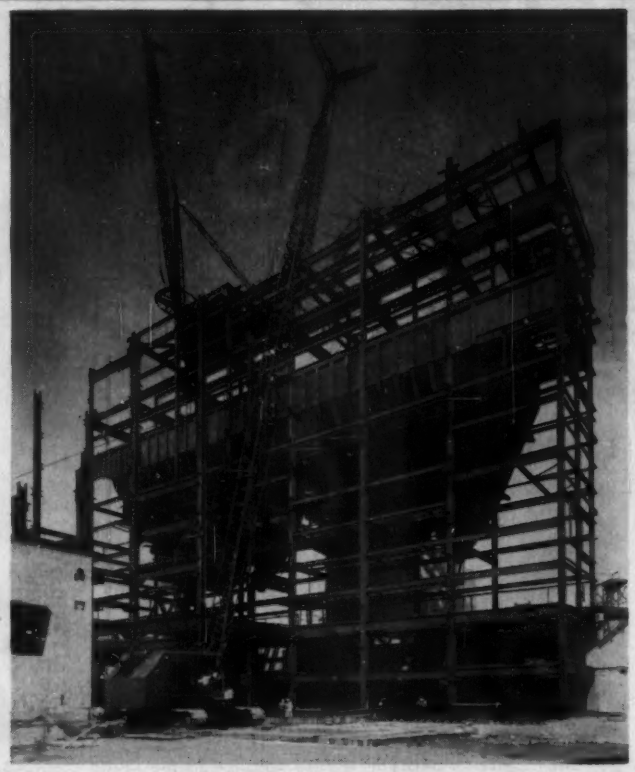
1907-1957 50 years Progress in Scientific Tree Care

BARTLETT TREE EXPERTS

Home Office, Research Laboratories and Experimental Grounds, Bartlett School of Tree Surgery, Stamford, Conn. Local Offices from Maine to the Carolinas, and West to Indiana. See your Local Telephone Directory for Local Address.

From INGALLS **More Power to You!**

Through the Strength and Economy of Fabricated Steel



Public Service Company of Indiana, Inc. New Albany Power Station Units #1 and #2 at Publico, Indiana.

ARCHITECTS & ENGINEERS: Sargent & Lundy CONTRACTOR: Gust K. Newberry Company, New Albany, Ind. STEEL FABRICATION: The Ingalls Iron Works Company STEEL ERECTION: The Ingalls Steel Construction Company

The Ingalls Iron Works Company was selected by the Public Service Company of Indiana, Inc. to fabricate the steel for Units #1 and #2 of the New Albany Power Station at Publico, Indiana. The Ingalls Steel Construction Company is handling its erection.

Ingalls' skill, ability and experience with fabricated steel for power plants have served in the construction programs of 46 of the nation's leading power companies . . . programs designed to meet the ever-increasing demand for more power.

These power plants, as well as thousands of other industrial and commercial buildings, are proof of Ingalls' ability to meet all requirements for the strength and economy of structural steel . . . with both fabrication and erection!

FABRICATING STEEL IS OUR BUSINESS!

Ingalls can serve you better. For complete information, write:

THE INGALLS IRON WORKS COMPANY

Established 1919

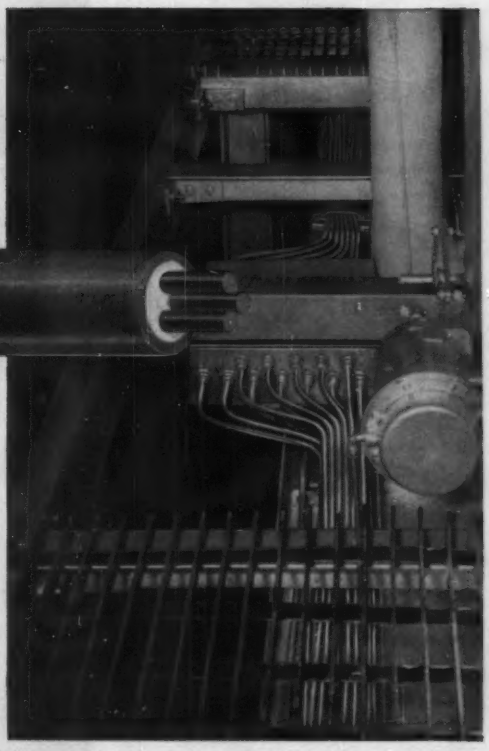
BIRMINGHAM, ALABAMA

Plants: Birmingham, Ala. • Verona, Pa. • North Birmingham, Ala. • Decatur, Ala. • Pascagoula, Miss.

FABRICATED STEEL for Power Plants • Hangars
Stadia • Stores • Bridges • Office Buildings • Theatres
Hotels • Apartment Houses • Hospitals • Churches • Schools
Industrial Buildings • Tanks • Bins • Pressure Vessels • Stacks

SAFETY m.i. CABLE

the answer to industrial power wiring...



- SPACE SAVING
- Time saving
- Permanent
- INSTALLED EASILY
- Fast power wiring to cut down-time

More and more General Cable's Safety MI 600 Volt Wiring System is being used because it can take the abuse of industrial application, giving trouble-free operation and unexcelled performance under the most severe conditions. Particularly adaptable in hot and wet locations. Available in 1, 2, 3, 4 and 7 conductor for power and control circuits.

MI terminating in main Japan Oven control center switchboard at Poinsett Lumber and Manufacturing Company, Anderson, S.C.

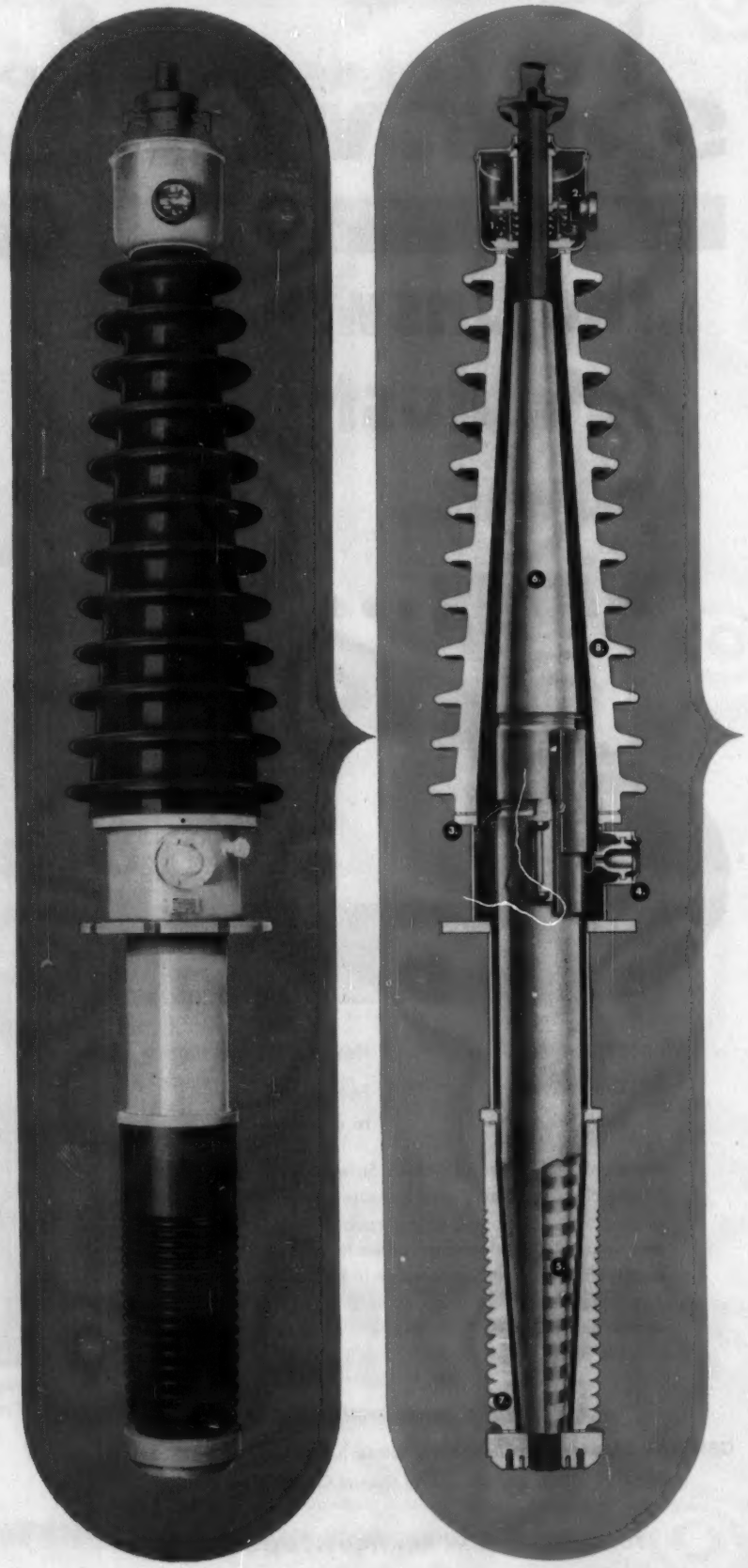
Ask for a Demonstration To-Day!

GENERAL CABLE CORPORATION, 420 Lexington Avenue, New York 17, N. Y.

Offices and Distributing Centers Coast-to-Coast

for quality and service...specify **GENERAL CABLE**

the inside story behind...



252,921 years of CORONA-FREE dependability...

THESE CONSTRUCTION DETAILS MEAN BETTER PERFORMANCE

1. Compression spring assembly
2. Inert gas space
3. Concentric gasket assembly
4. Potential tap receptacle
5. Concentric foil layers
6. Oil-impregnated condenser
7. Lower porcelain
8. Porcelain weather casing

Westinghouse type "O" Condenser Bushings for 92-345 kv

With over a quarter-million service years behind 43,553 Westinghouse Type "O" condenser bushings, there have been only two instances of electrical difficulty. You get extra dependability—under all conditions—from Type "O" bushings. Here's why . . .

Freedom from corona is maintained through uniform voltage distribution.—Free from voids.

Greatest mechanical strength is provided by an exclusive Westinghouse one-piece casing of wet-process porcelain, loaded in compression only. Condenser "floats" within casing, eliminating mechanical stress.

Highest electrical strength is obtained from continuously wound, oil-impregnated kraft paper and concentric foil layers. Insulation remains free from mechanical loading. These bushings have greater dielectric strength than any other bushings made . . . supplemented by a superior design potential tap. Insulation has not been reduced at the expense of reliability.

Highest thermal stability provides longer service life. The lowest power factor of any known bushing test limits 0.6% at 25° C, 1.0% at 85° C. Copper is worked at low current density to prevent internal heating . . . free from hot spots.

For complete information about Type "O" bushings, call your Westinghouse representative . . . or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70825

YOU CAN BE SURE...IF IT'S

Westinghouse

There IS a Difference!

Connectors may look alike but it's PERFORMANCE that counts

BLACKBURN CONNECTORS OUT-PERFORM THEM ALL

Because They Are . . .

BETTER MECHANICALLY

- Made of high strength duronze, a silicon bronze alloy stronger than structural steel.
- Machine cut threads, *CFC treated, provides more thread engagement —reduces friction and increases thread efficiency. *Chemical Friction Control.
- Rigid inspection of each production operation assures uniformly good connectors.

BETTER ELECTRICALLY

- High clamping force—the result of greater thread efficiency breaks down oxide on the conductor improving conductivity.
- Higher initial conductivity, actually greater than an equal length of conductor is maintained permanently.

REUSABLE

- Selection of proper high-strength, corrosion-resistant materials—plus precision workmanship and inspection—means Blackburn connectors may be used over and over.

BLACKBURN *Hi-Strength* **CONNECTORS**

AVAILABLE AT ELECTRICAL WHOLESALERS EVERYWHERE

JASPER BLACKBURN CORP., 1525 Woodson Rd., St. Louis 14, Mo., WYdown 3-9430

POWERS *American*

"Earth-Master"

HYDRAULIC HOLE DIGGER

IDEAL FOR USE IN COMBINATION WITH "POLE-MASTER" SERIES PM-2 HYDRAULIC DERRICK

- Ready for use in seconds . . . at the flick of a control
- Digs holes that are always straight . . . always clean
- "Down pressure" to spare . . . for digging frozen soil or "hard pan"
- Easily removed and transferred to another vehicle
- Stows in cradle above body . . . does not increase overall body height or obstruct load area when used with Pole-Master Series PM-2 Derrick
- Can be used for digging on opposite side of fences
- Swings out of the way when derrick is to be used for setting pole

Earth-Master digs holes hydraulically . . . up to 9' 4" in depth. It will dig at various angles in most types of soil. The hydraulically-powered auger, traveling up and down on a twin-column support frame, is guided at all times — digs holes that are always straight, always clean.

The auger is raised and lowered by a reversible hydraulic motor; rotated in either direction by a separate hydraulic motor. Power is derived from a hydraulic pump driven by the truck engine.

There's plenty of "down pressure" for digging in hard soil . . . supplied by the drive motor and the downward thrust which can be applied to the support frame with the hydraulic derrick.

Digger controls are located beside derrick controls in right rear body compartment . . . giving operator full view of all digger and derrick movement. An automatic, self-resetting relief valve protects the digger and hydraulic system against overload.

Earth-Master is ideal for use with the Powers-American Pole-Master Series PM-2 Hydraulic Derrick. It can be installed on derricks now in use, or factory-mounted in conjunction with a Pole-Master Derrick on a Powers-American Line Body that fits your job needs. Standard augers up to 20" in diameter can be furnished. Digger can be supplied with special Pengo Heads for digging where soil condition retards auger.

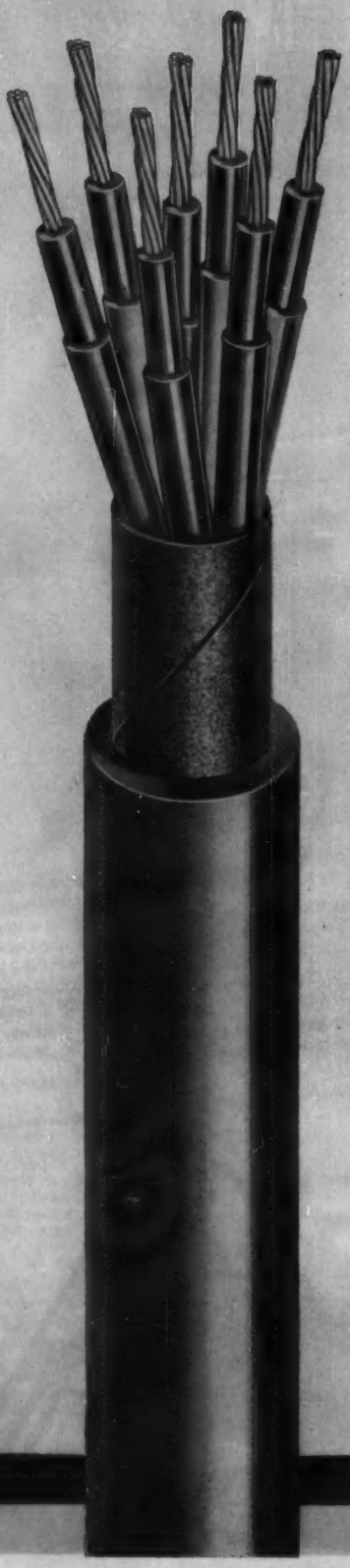
Price information and descriptive literature will be sent upon request.

Support frame can be turned to various angles . . . extended to fit operating conditions.

McCABE-POWERS AUTO BODY COMPANY

5900 NO. BROADWAY • ST. LOUIS 15, MO.

625 CEDAR STREET • BERKELEY 10, CALIF.



Consider these advantages of control cable utilizing

ALATHON® and ZYTEL®

POLYETHYLENE RESINS — NYLON RESIN

● Primary insulation of either ALATHON 3C or 5B, NC-10 polyethylene resins is particularly outstanding for use in control cable constructions. In addition, ZYTEL 33 nylon resin and ALATHON 4, BK-30 offer advantages as skin and jacketing materials.

Because both ALATHON 3C and 5B have excellent electrical properties, a thinner primary insulation can be used. Their low power factor and dielectric constant keep energy losses at an economical minimum. ALATHON 3C is available in eleven colors for coding purposes, while 5B is colorless.

ZYTEL 33, used as a skin over the primary insulation, imparts exceptional toughness. This is important at termination points where rough handling can be expected, and in cases where the cable may get over-heated.

Jacketing of ALATHON 4, BK-30 has remarkable toughness and strength, giving maximum protection and long service life while maintaining a neat appearance. It also offers outstanding resistance to abrasion, moisture and weathering.

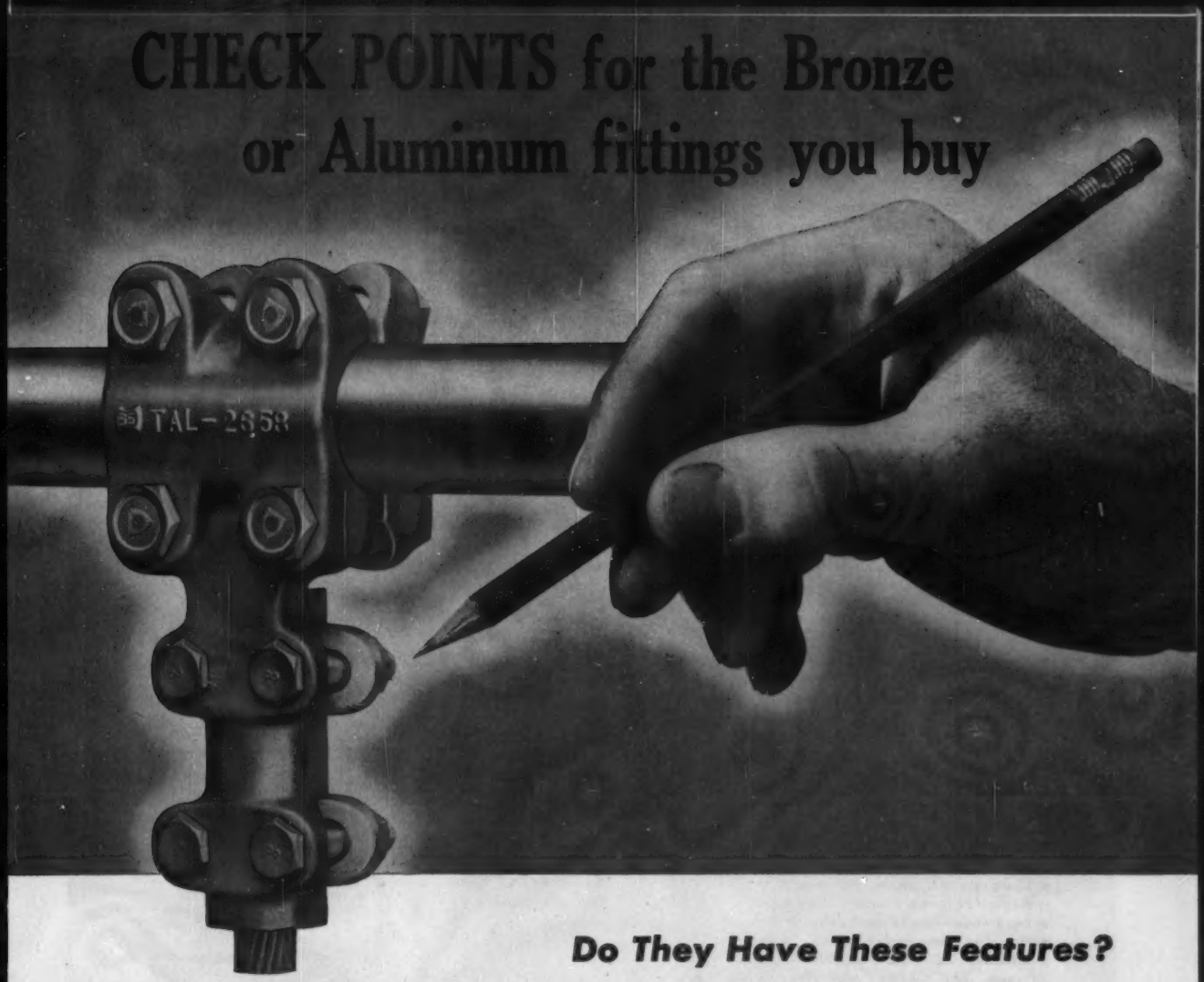
Du Pont has established a family of ALATHON polyethylene resins, each suited to a range of insulating and jacketing applications. Consult with your supplier. He will be happy to explain the advantages of a wire and cable construction—utilizing ALATHON and ZYTEL—tailored to meet your specific requirements; or write to E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Department, Room 48-12-9, Wilmington 98, Delaware.

Illustrated control cable construction by Collyer Insulated Wire Company, Pawtucket, R. I.

DU PONT

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

CHECK POINTS for the Bronze or Aluminum fittings you buy



Southern States Connectors Meet Every Single Requirement

Never underestimate the importance of a good connection!

A faulty connection can mean trouble and cost you money!

The failure of any connector, no matter how insignificant, can cause a circuit interruption as surely as any major system component. That's why it pays to select the fittings for today's heavily loaded systems with a great deal of care.

Take a look at the check list at right. If you can't answer "yes" to these questions, then the fittings going into your system may be inadequate.

Southern States bronze and aluminum fittings meet every single requirement listed.

For complete information write for catalogs describing Southern States' complete line of bronze and aluminum fittings.

Do They Have These Features?

	YES	NO
Are they structurally strong enough to prevent pull-out of conductors?	☐	☐
Are stress points rugged with cross-sectional strength to spare?	☐	☐
Are bolt heads recessed for single-wrench assembly and disassembly?	☐	☐
Do contact surfaces accurately match curvature of conductor?	☐	☐
Are contact surfaces finished to provide multi-point engagement with conductor?	☐	☐
Are castings fine grained, with smooth pit-free surfaces?	☐	☐
Are contact surfaces extra-large to provide maximum engagement?	☐	☐
Are bolts of standard size and thread for ready replacement from local sources?	☐	☐
Is the over-all appearance of the connector pleasing and not excessively heavy?	☐	☐
Do they meet NEMA standards in every respect?	☐	☐

LIVE BETTER ELECTRICALLY

IN CANADA: Dominion Cutout Co., Ltd., Toronto

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

The Fifty Largest Utilities as listed in the 1957 FORTUNE DIRECTORY

★ American Tel. & Tel. (New York)
★ Pacific Gas & Electric (San Francisco)
★ Consolidated Edison of New York
★ Commonwealth Edison (Chicago)
★ American Gas & Electric (New York)
★ Tennessee Gas Transmission (Houston)
★ Public Service Elec. & Gas (Newark, N. J.)
★ Southern California Edison (Los Angeles)
★ Southern Co. (New York)
★ Detroit Edison (Detroit)
★ Philadelphia Electric (Philadelphia)
★ Niagara Mohawk Power (Syracuse, N. Y.)
★ General Telephone (New York)
★ El Paso Natural Gas (El Paso, Texas)
★ Columbia Gas System (New York)
★ General Public Utilities (New York)
★ Consumers Power (Jackson, Mich.)
★ American & Foreign Power (New York)
★ American Natural Gas (New York)
★ United Gas (Shreveport, La.)
★ Texas Utilities (Dallas)
★ Middle South Utilities (New York)
★ Pacific Lighting (San Francisco)
★ Texas Eastern Transm. (Shreveport, La.)
★ Consolidated Natural Gas (New York)
★ Central & South West (Wilmington, Del.)
★ New England Electric System (Boston)
★ Pennsylvania Power & Light (Allentown)
★ Union Electric (St. Louis)
★ Ohio Edison (Akron)
★ Virginia Electric & Power (Richmond)
★ Peoples Gas Light & Coke (Chicago)
★ Northern States Power (Minneapolis)
★ Cleveland Electric Illum. (Cleveland)
★ West Penn Electric (New York)
★ Duke Power (Charlotte, N. C.)
★ Long Island Lighting (Mineola, N. Y.)
★ Baltimore Gas & Electric (Baltimore)
★ Duquesne Light (Pittsburgh)
★ Northern Natural Gas (Omaha, Neb.)
★ Wisconsin Electric Power (Milwaukee)
★ Transcontinental Gas Pipe Line (Houston)
★ Panhandle Eastern Pipe Line (New York)
★ Public Service of Indiana (Plainfield)
★ Florida Power & Light (Miami)
★ Illinois Power (Decatur, Ill.)
★ Western Union Telegraph (New York)
★ Boston Edison (Boston)
★ New York State Electric & Gas (Binghamton)
★ Cincinnati Gas & Electric (Cincinnati)

© 1957 Time Inc.

Among the 50 largest utilities, only one electric or telephone utility is a Preformed prospect...

the rest are Preformed customers

In July, 1947, Preformed Line Products Company didn't have a customer; all the electric and telephone utilities were prospects. Today, the situation is almost completely reversed.

For example, in FORTUNE's list of the "Fifty Largest" utilities, only one of the *electric* and *telephone* utilities mentioned is still a prospect; all the rest are now Preformed customers. In other words, the Preformed principle of using preformed helical rods for line accessories has gained almost complete acceptance in only 10 years.

If you are among the few utilities not utilizing Preformed, you might ask "Why?". PREFORMED LINE PRODUCTS COMPANY, 5349 St. Clair Avenue, Cleveland 3, Ohio. Cable Address: Preformed-Cleveland ...in 10 years the leading manufacturer or armor rods, dead-ends, Guy-Grip dead-ends, splices and other line accessories.

PLP

You can look up to Preformed

Unique arrangement makes possible full-load testing of

world's LARGEST 2-pole induction motors

. . . 6000 hp, 3600 rpm

To obtain full-load operating data on the world's largest 2-pole squirrel-cage induction motors requires facilities beyond the scope of ordinary motor testing. Through an ingeniously engineered arrangement, Elliott has been able to perform all the standard full-load tests on these 6000-hp boiler-feed pump motors—checking efficiency, slip, temperature and other important characteristics.

Here's one more example of Elliott's experience and leadership in designing, building *and testing* large motors. Elliott built the first large 2-pole motor in 1916 and over the years has pioneered in advanced designs. And today, Elliott has either built or has on order 39 of the largest 2-pole machines ever undertaken . . . 11 motors, each 4500 hp . . . 24 motors, each 5000 hp . . . and four 6000-hp machines, two of which are shown above on test.

Some of the complete tests which Elliott applied to its large 2-pole squirrel-cage induction motors

Temperature rise
Efficiency
Power factor
Torques (starting and breakdown)
Full-load speed
Starting current inrush
No-load current
Rotor balance
Dielectric test

ELLIOTT Company

Ridgway Plant Ridgway, Pa.

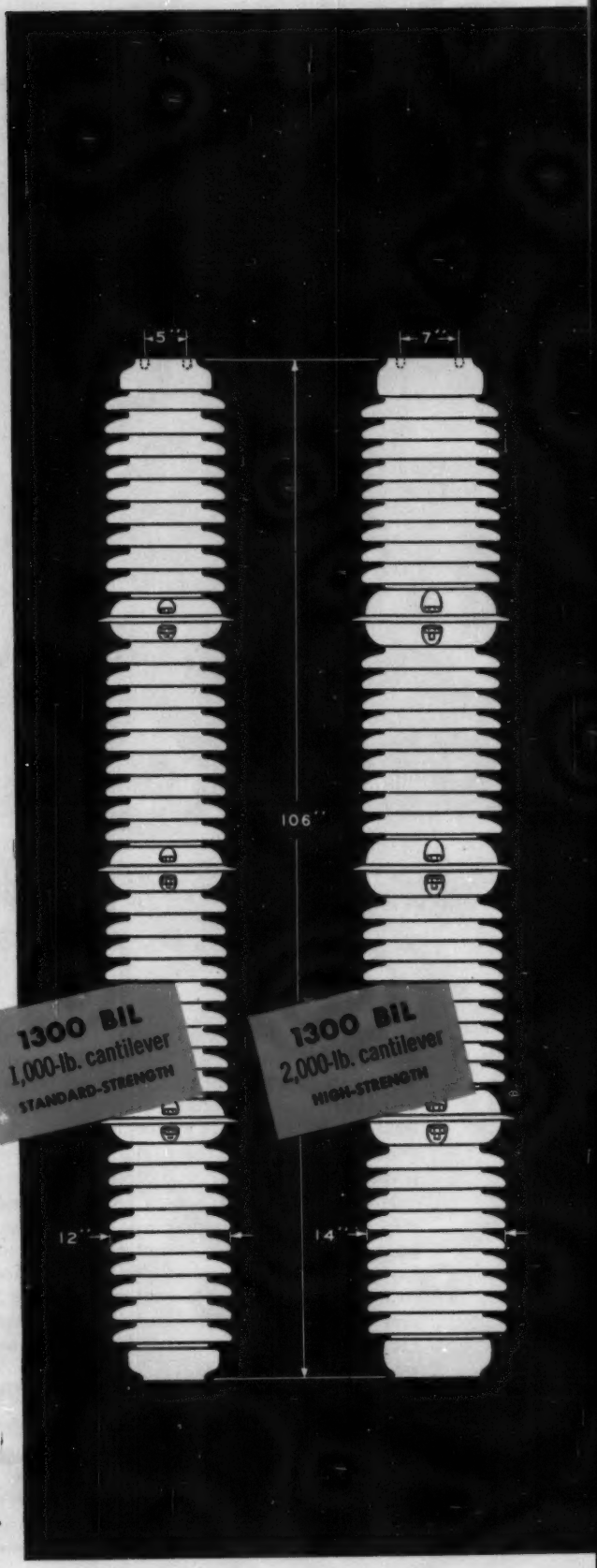
Ask for "Milestones" booklet which gives the full story of Elliott large 2-pole machines.

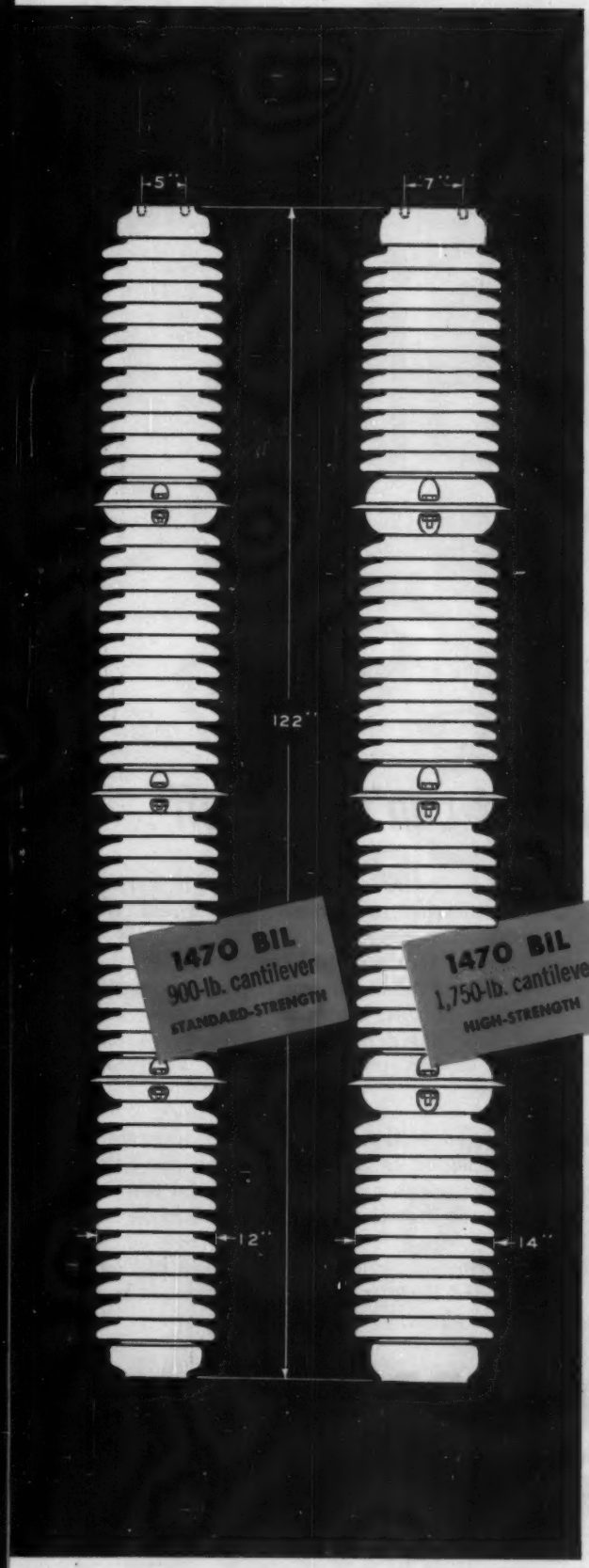
R7-35

Steam Turbines • Motors • Generators • Deaerating Heaters • Ejectors • Condensers • Compressors • Turbochargers • Tube Cleaners • Strainers

Announcing

Lapp STATION POSTS FOR EHV SERVICE





DESIGN FLEXIBILITY... LOWEST COSTS...
GREATER OPERATING SECURITY...
FOR YOUR NEW HIGHEST-VOLTAGE STATIONS

RIGID SUPPORT FOR SWITCHES AND BUS. Deflection at design loads is only one-half as great for standard-strength Lapp Station Posts as for comparable pin-cap insulator stacks. *Positive switch alignment.*

NEW HIGHER STRENGTH. "Standard-Strength" Station Posts match NEMA strength ratings of pin-cap insulator stacks for 1300 and 1470 BIL. The "High-Strength" Lapp Station Posts provide strength (and rigidity) values not offered in any conventional insulator construction. *Maximum design flexibility.*

REDUCE CONSTRUCTION COST. Light weight saves in supporting structure and construction cost. No sub-bases required. Assembled and installed with only 20 bolts. *Faster, more compact, economical construction.*

IMPROVED MECHANICAL AND ELECTRICAL PERFORMANCE. There's a minimum number of cemented joints in a Lapp Station Post—only eight for either the 1300 BIL or 1470 BIL units (as compared with 21 cemented joints for a 1300 BIL or 24 for a 1470 BIL unit of pin-cap design). Furthermore, each cemented joint of the Lapp Post is a large-area low-compression grip which can load porcelain only in compression. *No cracking.* As with all Lapp Station Post insulators fog-type corrugations are self-cleaning in wind and rain. *No cleaning.*

Write for specifications and data.

Lapp

Lapp Insulator Co., Inc., Le Roy, New York

...quality that can't wear off

On the surface, many ground rods look good. But in *service*, there's a big, better difference to Hubbard Copperweld. By an exclusive, molten-welding process, a thick, uniform layer of pure copper is fused to an alloy steel core. Instantly, the two metals become as one, with the desirable qualities of each inseparably joined. As a result, Hubbard Copperweld Sectional Ground Rods have the *permanent* rust resistance and conductance of solid copper, plus the strength and easy driving qualities of steel.

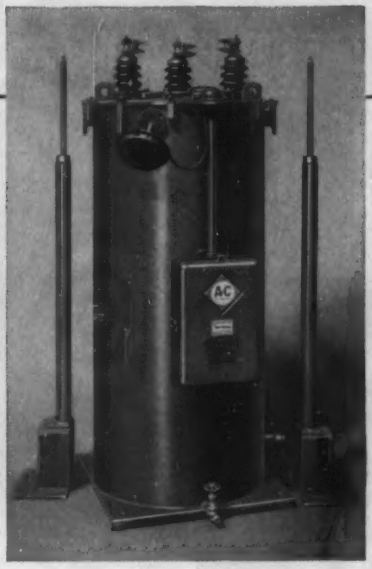
DRIVE DEEP. Additional sections of Hubbard Copperweld Ground Rods may be added as required to reach the good conducting soils of permanent moisture. Resistance can be measured after driving each section, and allowance made for seasonal variation.

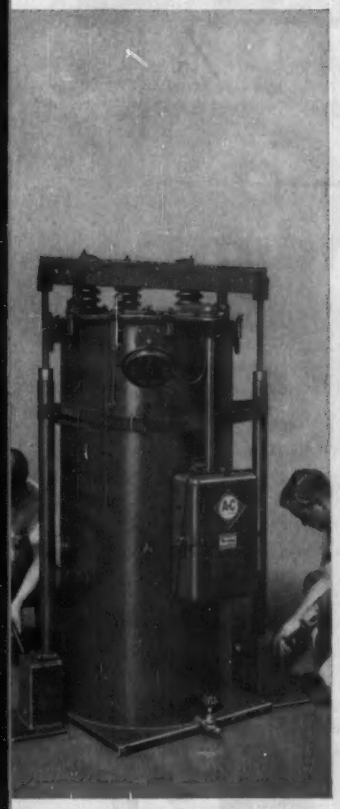
Your Hubbard Distributor carries complete stocks of Copperweld Sectional Ground Rods and accessories. Contact him for prices and full information.

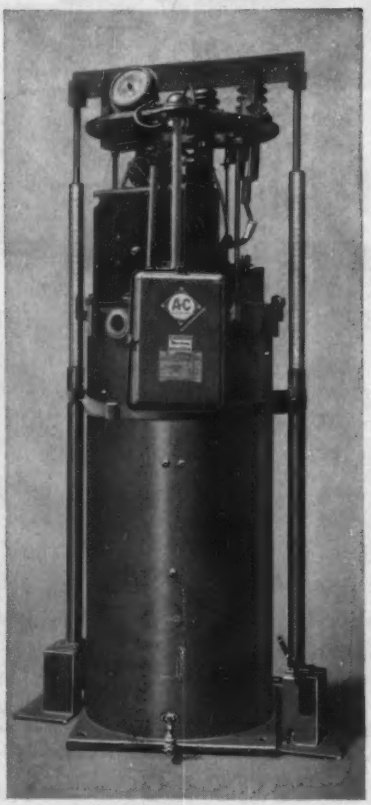
HUBBARD AND COMPANY

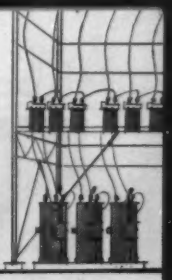
Pittsburgh 1, Pa. • Chicago 50, Ill. • Oakland 8, Calif. • Plano, Texas

Allis-Chalmers – Originators of 5/8% Step Regulators









Get "On-the-Site" Inspection with Unit Construction

Allis-Chalmers unit construction means the transformer and tap-changing mechanism are suspended from the cover. This assures these advantages:

Easy servicing — Piecemeal inspection is eliminated by unit construction and cover suspension. There's no need to drain oil, remove bushings or control leads, or move the regulator. Field inspection is further simplified with inspection jacks which are used, as shown in photos at left, to raise mechanism high enough to permit servicing on-the-spot.

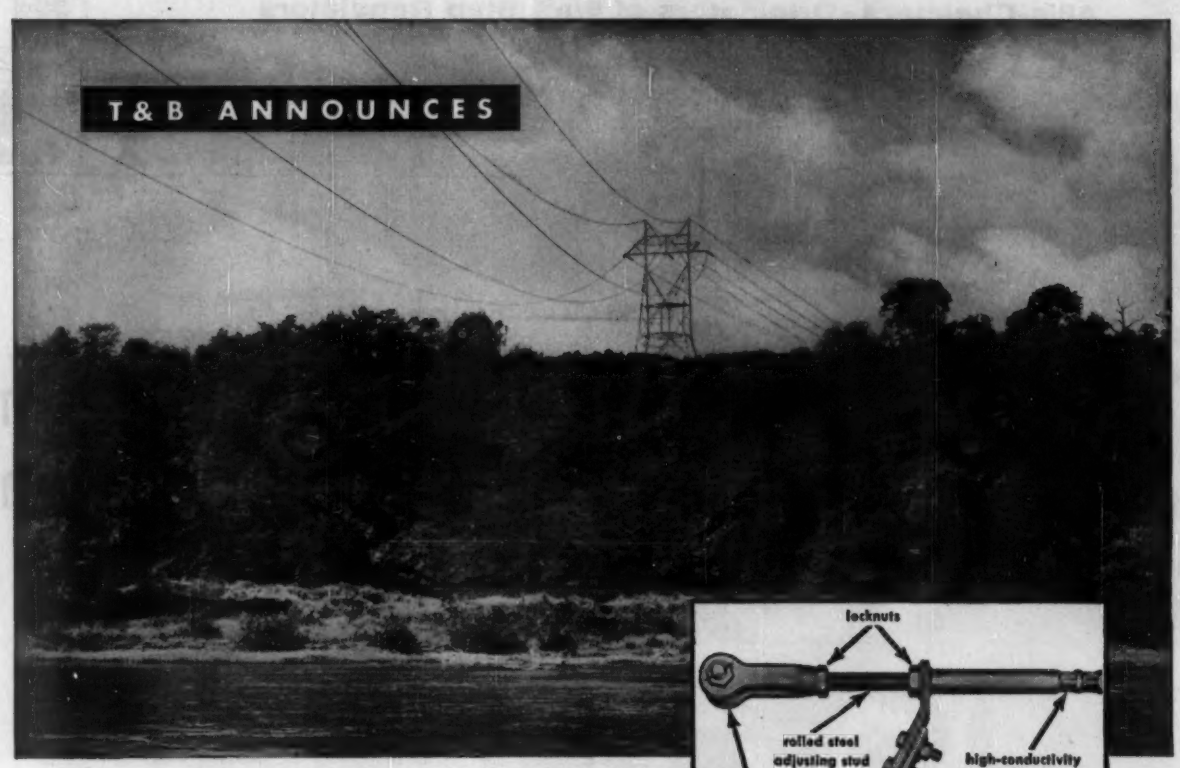
Superior workmanship — All connections during manufacturing are made out in the open before the unit is tanked. Entire operating mechanism and control can be inspected and operated while untanked.

* * *

For details of these and other advantages of Allis-Chalmers regulators, call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-5587



a new concept in transmission dead ending!

DEAD END CONNECTORS PERMIT SAG CORRECTION AFTER JOINT IS COMPLETED

Now you can adjust conductor sag to specification after the strain connection has been made! Four inches of clevis adjustment available provides great sag adjustment. For example: in a 700 foot span of 795,000 CM A.C.S.R. sagged at 50% of ultimate strength, the 4 inch clevis adjustment will allow 4 feet of sag adjustment.

The new dead end connector gives many important advantages: transmission line dead ending at river crossing and over rough terrain is simplified, more economical; "bundled" cables can be easily sagged with complete uniformity; line measurement errors can be readily compensated.

T&B Dead Ends are available for all commercial sizes of A.C.S.R. and all-aluminum conductors in three types: single bolting pad, double bolting pad, and with an integral compression loop connection.

For complete specifications on the new dead ends, as well as the complete new catalog of T&B Method transmission line connectors, tools and accessories, send the coupon below.

AUTHORIZED DISTRIBUTOR T&B ENGINEERED

LOOK FOR THIS SIGN — IT'S THE MARK OF AN AUTHORIZED DISTRIBUTOR

THE THOMAS & BETTS CO. INCORPORATED

14 BUTLER STREET, ELIZABETH 1, NEW JERSEY

Please send me the new T&B Method Bulletin 70

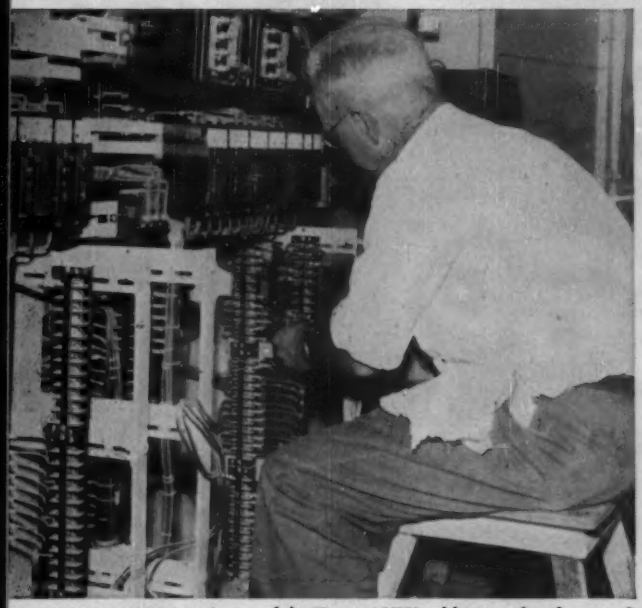
Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

Whatever you want in control cable—Anaconda has it!



PEAK RELIABILITY. Anaconda's Type ANW-rubber-insulated control cable is a high-quality product which features unusual heat resistance. It is also highly resistant to attack by moisture, acids, alkalies and other chemicals. Individual conductor covering and over-all jacket of neoprene.

MULTIPLE USE. Anaconda thermoplastic control cables can be installed aerially, in conduit, underground in ducts—or buried directly in the earth. They are available with either polyethylene (600 or 1000 volts) or Densheath* vinyl resin (600 volts) insulation and Densheath over-all jacket. Also with Densheath conductor covers on request.

OZONE-RESISTANCE. For station control applications where ozone conditions prevail, Anaconda offers a special low-voltage butyl-insulated cable. This control cable not only resists ozone, but individual conductor covering and over-all jacket of neoprene provide maximum insurance against moisture and mechanical injury.

SPACE-SAVER. You can install a 12-conductor cable in conduit now carrying a 6 or 7—with Anaconda Type PND† Control Cable. Individual conductor coverings of moisture-, oil- and gasoline-resistant nylon. Over-all Densheath jacket. Designed for general-purpose control requirements where space is a limiting factor.

Permanent Full Color Coding on rubber cables, by means of Anaconda's rubber-base coating, assures quick and positive circuit identification. Coding by surface printing, which conforms to IPCEA standards, also available. On thermoplastic cables, full color coding with pigmented insulation and surface printed coding are likewise offered. For information on any of Anaconda's Control Cables—including cables engineered for more specialized control requirements—see your Anaconda distributor or the Man from Anaconda. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

*Reg. U.S. Pat. Off. 87389
†Trademark

SEE THE MAN FROM ANACONDA®
FOR CONTROL CABLE

Helping the industry meet its growing loads

New 138-kv air breaker brings high-voltage economies to congested load areas

Westinghouse developed this new compressed-air breaker to meet the need of utilities for higher voltages in crowded industrial and downtown sections. Line losses with voltages generally available on utility systems have been staggering. Although many utilities have planned for higher voltages to combat these losses, they have until now been limited by available air circuit breaker ratings to substations of 69-kv with 5-million-kva fault capacity.

Now, through the forward-looking research facilities at the High Power Laboratory, Westinghouse has made available the first steel dead-tank 138-kv compressed-air breaker with an interrupting capacity of 10-million-kva. The inherent safety of this air breaker permits location of substations right in the heart of the city. The first installation, at Consolidated Edison of New York, is used to protect their urban system.

These Westinghouse breakers operate at a comparatively low noise level, so important in busy downtown areas, through use of a unique exhaust-chamber design permitting release of compressed air through the bushing. Every day, Westinghouse research and development works to increase utility operating efficiencies by making available products such as this new 10-million-kva compressed-air circuit breaker.

J-97213

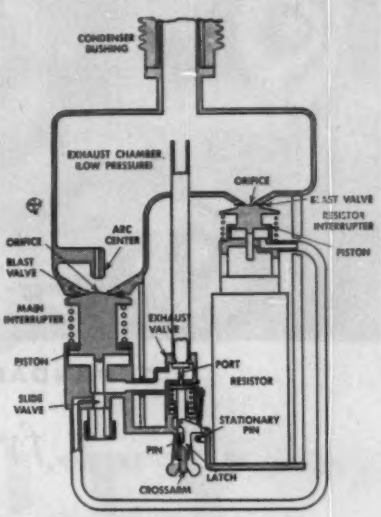
YOU CAN BE SURE...IF IT'S

Westinghouse

New compressed-air design

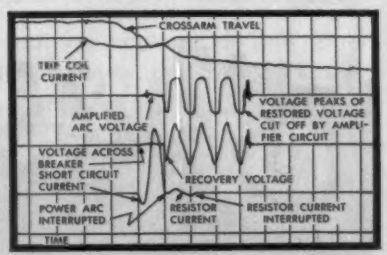
The new Westinghouse breaker incorporates many of the best features of both oil and air breakers. For instance, provisions are made for the use of bushing-type current transformers and potential devices. Two orifice interrupters, of the time proven 69-kv type, are used in series for 138-kv operations. Circuit interrupters are suspended from the ends of the condenser bushings. Mechanically interlocked drive operates all three pole units simultaneously, minimizing pneumatic variation.

Initial downward movement of crossarm isolator actuates pneumatic sequence: air interrupts arc as main contacts open, current is transferred to resistor, resistor contacts open . . . air interrupts arc . . . circuit interruption is complete, moving contact bar breaks away from interrupter . . . deactivates air circuit. Orifice is reset for subsequent operations.



3-cycle interrupting

Standard ASA tests were made at 250 and 200 psi in the Westinghouse High Power Laboratory, demonstrating 3-cycle interruption with closing and reclosing timing within 20 cycles on a 60-cycle basis. Here's true protection for the modern high-voltage urban system . . . with high continuity of service.



Proved capacity

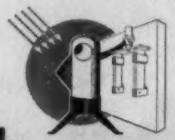
The oscillogram above illustrates the operation of a **single** interrupter assembly during the interruption of 44,000 amperes. The breaker will withstand system voltages at atmospheric pressure.

DEPENDABLE OUTDOOR LIGHTING CONTROL

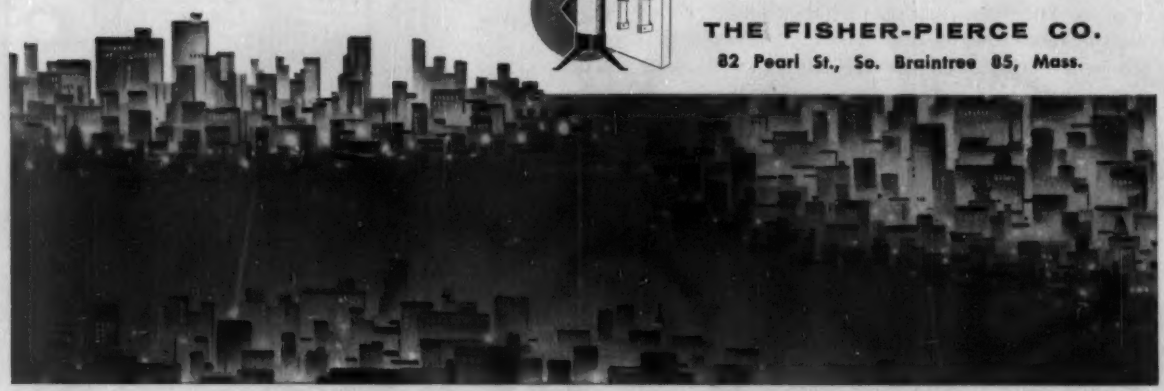
.....from coast to coast

Throughout the United States, Fisher-Pierce units have provided more hours of dependable street light control than any other make of photoelectric control. For more than twelve years Fisher-Pierce has set the pace in the development and manufacture of photoelectric controls for all types of outdoor lighting.

Today Fisher-Pierce, backed by an organization of 600 people, offers unlimited facilities for the development of new controls and allied products for the electric utility industry . . . as well as the extensive service organization that stands behind each F-P control. Whether your requirements call for proven lighting controls for any type of outdoor lighting, development of new electric or electronic products, or engineering service in the installation and maintenance of lighting control systems . . . call on Fisher-Pierce.



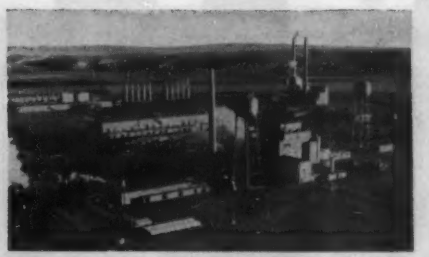
THE FISHER-PIERCE CO.
82 Pearl St., So. Braintree 85, Mass.



call KE for plant expansion or new facilities

INGENUITY

has made KE the experienced leader in nuclear projects



Project: construction of large plutonium production plants. KE work involved reactors, shielding, extensive instrumentation, stainless steel piping, machinery installations and other complex construction. KE completed job ahead of schedule and below the budget.

Cost-saving and time-saving ingenuity, plus a wealth of nuclear experience—these are two of many reasons why Kaiser Engineers has been selected for so many of America's challenging nuclear projects. To date, value of KE nuclear projects amounts to more than $165,000,000.

KE provides complete nuclear engineering and construction services—including concept feasibility, reactor criteria, facility design, construction and test operations.

KE nuclear specialists are ready to serve you today. Call KE for design and construction, or any aspect, of nuclear research, production or power facilities.

KAISER ENGINEERS engineers—contractors
Contracting since 1914

4388

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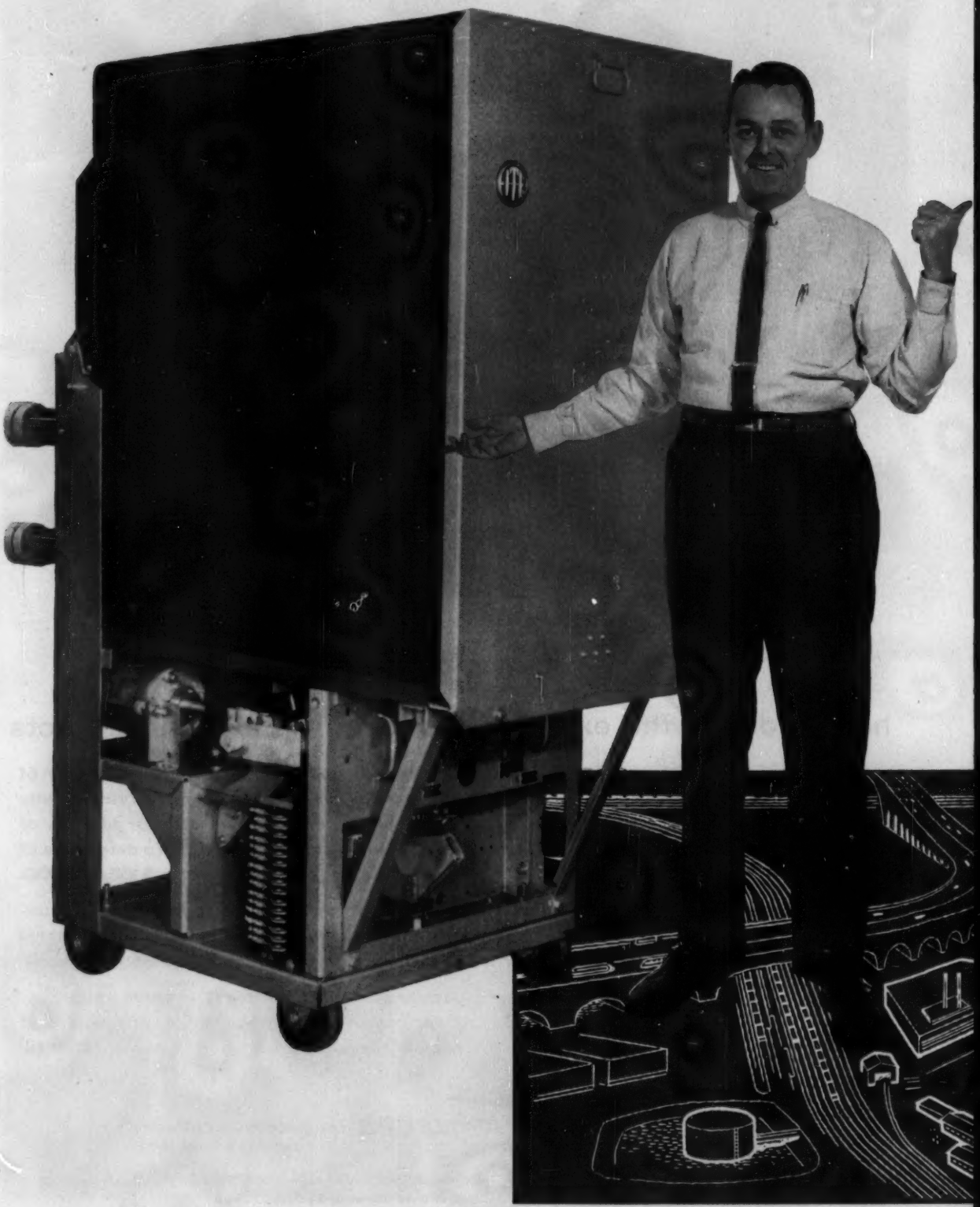

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Enjoy all the safety, compactness, negligible maintenance, and economy of air magnetic circuit breakers even up in this new high range. You can do it now. Quality I-T-E metal-clad switchgear is available in million kva, 1200 and 3000 amp ratings for 1958 delivery. The first installation is scheduled for the new substation of a large Eastern power company. Other orders are being taken now. Write for complete technical information on your specific application. Switchgear Division, I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa.

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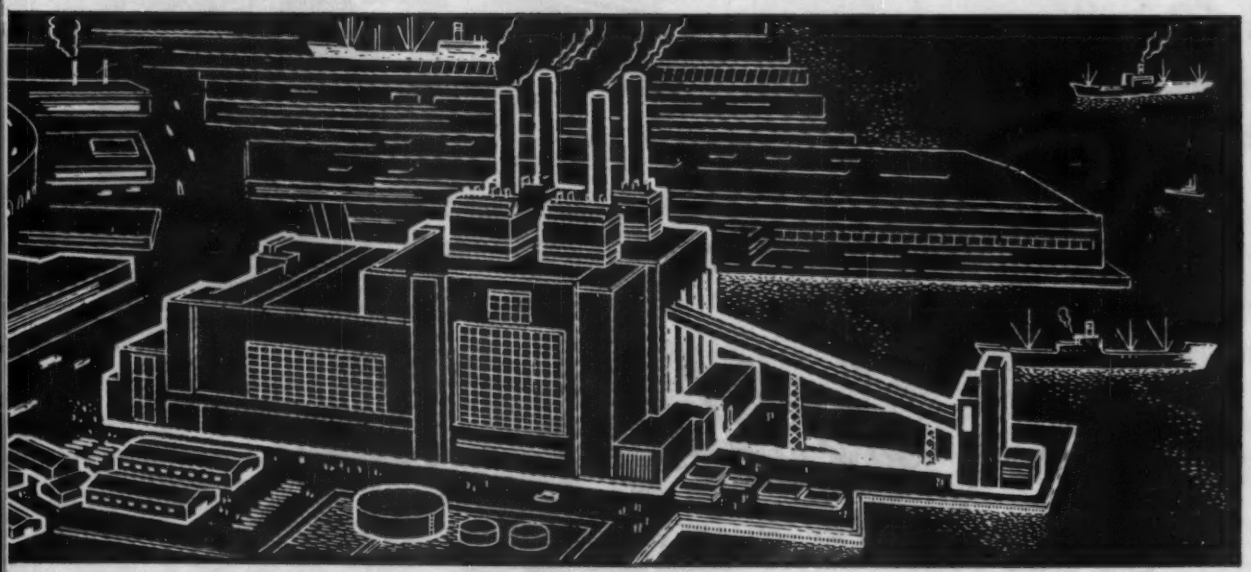

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provide a continuous sheath with insulating properties to match the
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A quality tape of lasting "tack" and fusion, Gold Seal molds easily
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Made by Jenkins Bros.,
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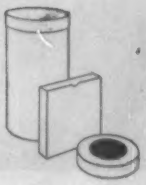

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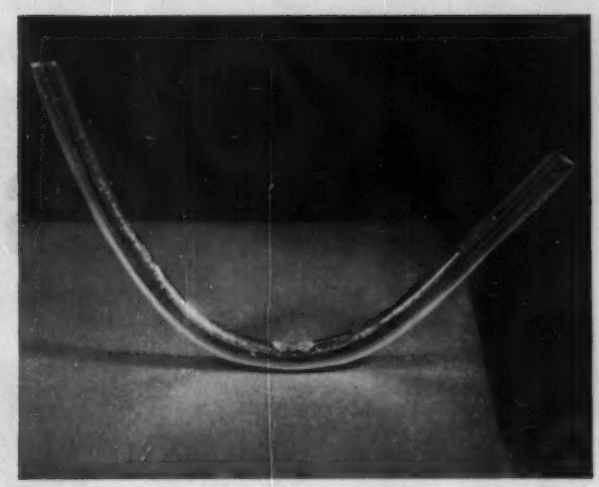
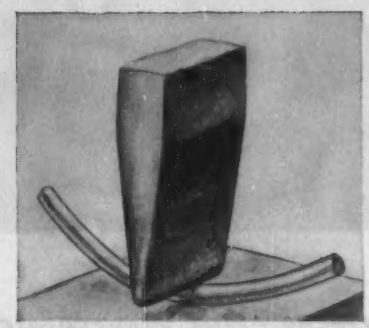
Commercial and Specification Grades

Thermo-compression bonding—



Wire bonded to germanium by thermo-compression technique (enlarged). Wires only 1/10 the breadth of a human hair have been successfully anchored to germanium wafers only three hairs thick. The bond may be an ohmic contact or rectifying contact by adding suitable impurities to the wire and the semiconductor.



One method of thermo-compression bonding. A heated wedge presses a wire against a heated semiconductor with enough force to deform the wire. Adhesion occurs in seconds.

new way to join metal to semiconductors

Thermo-compression bonding provides a new way to attach a wire to a semiconductor. It calls for heat and pressure—nothing else. The wire and the semiconductor are moderately heated, then pressed together under moderate pressure. The resulting bond is very strong—stronger actually than the wire. No chemical flux or molten metal is required.

Eliminating molten metal provides an enormous advantage in fixing electrical connections to transistors. That's because molten metal tends to spatter and spread uncontrollably over the surface of a semiconductor. And it may alloy with the semiconductor to alter its all-important crystalline structure and chemical purity. Thermo-compression bonding easily and quickly makes a strong permanent electrical connection without damaging the semiconductor. Furthermore, the lead may be attached to microscopic areas and precisely positioned, a most valuable aid in the construction of high-frequency transistors.

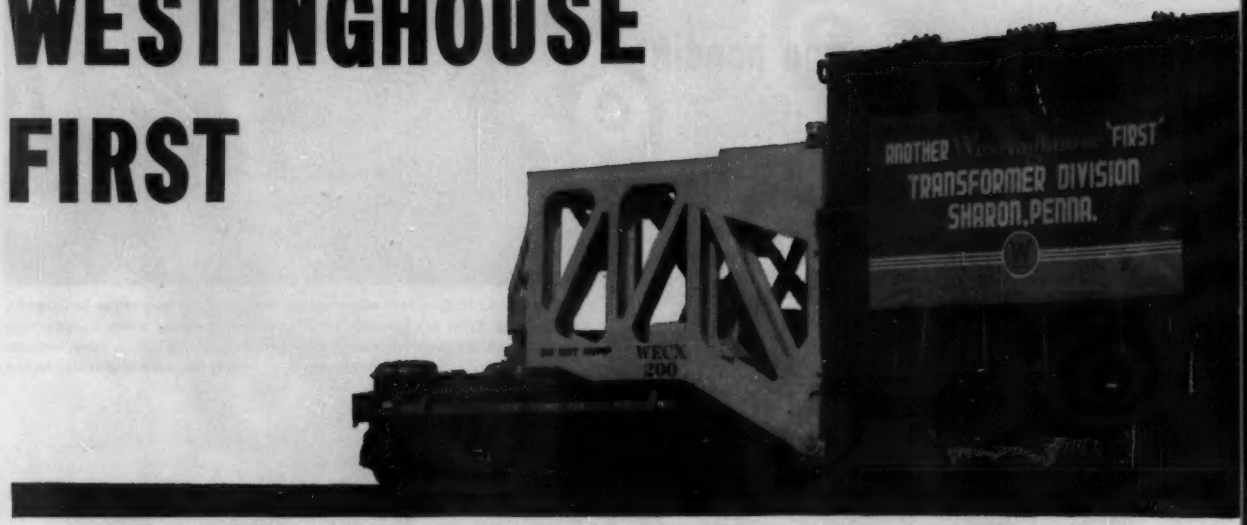
Thermo-compression bonding will speed the production of transistors . . . the transistors needed to fill all the new jobs Bell Laboratories finds for them in the quest to provide still better telephone service to our growing country.

At Bell Labs Howard Christensen and Orson Anderson discuss their discovery of new bonding principle with Peter Andreatch, Jr., who collaborated in the studies.

BELL TELEPHONE LABORATORIES

WORLD CENTER OF COMMUNICATIONS RESEARCH AND DEVELOPMENT

ANOTHER WESTINGHOUSE FIRST

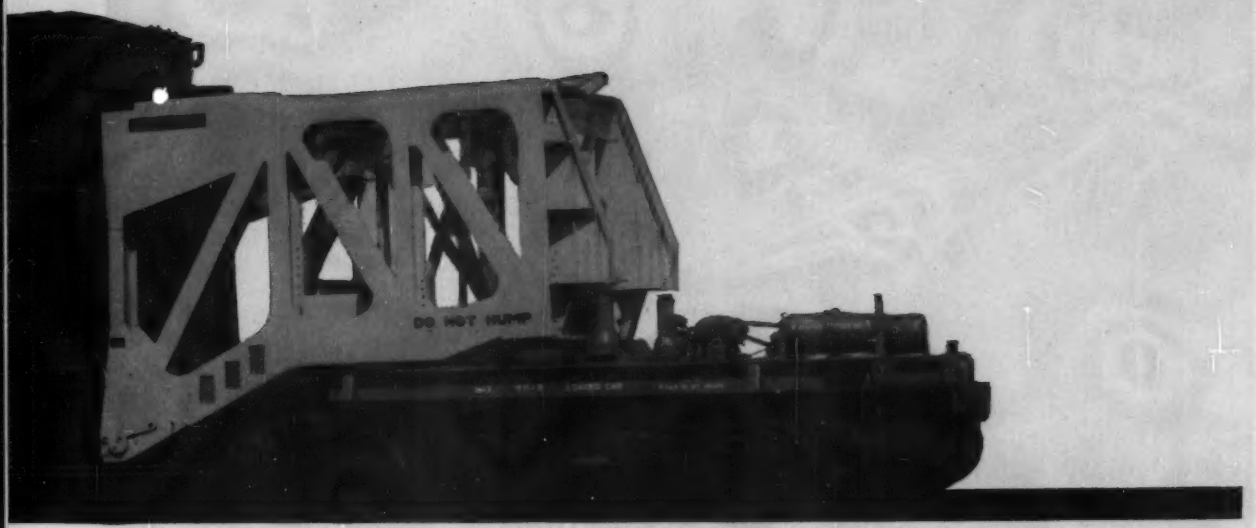


NEW SHIPPING METHOD DELIVERS GIANT TRANSFORMER

For the first time, a transformer has been shipped as part of its own railroad car! En route to the Ohio Power Company's Kammer plant at Captina, West Virginia, this 200,000-kva, 330-kv autotransformer became the center section of a revolutionary three-section railroad car—the nation's first car of this type.

Designed by Westinghouse and built by the Greenville Steel Car Company, the new car will permit transformers up to 250 tons to be shipped in one piece—upright, and without sectionalizing.

The new car consists of two identical end sections, with the transformer comprising the center section and suspended between trusses mounted on each end. Although the car is 90 feet long when



AS PART OF CAR, REDUCES INSTALLATION TIME AND COST

loaded, it can negotiate the same curves as a standard boxcar. The result: direct routing, helping to speed your construction schedules.

The combination of this new shipping method and Westinghouse "Form-Fit"® design provides a sure means of producing transformers with ratings adequate for future needs. Utilizing basic shell-form design with the core surrounding the coils, Form-Fit design provides a more compact transformer with superior mechanical and dielectric strength, greater thermal capacity—the highest rating-per-pound available. The new railroad car adds *extra* growth potential to this "room-to-grow" design, by providing assured delivery for your higher capacity transformers of the future. J-70828

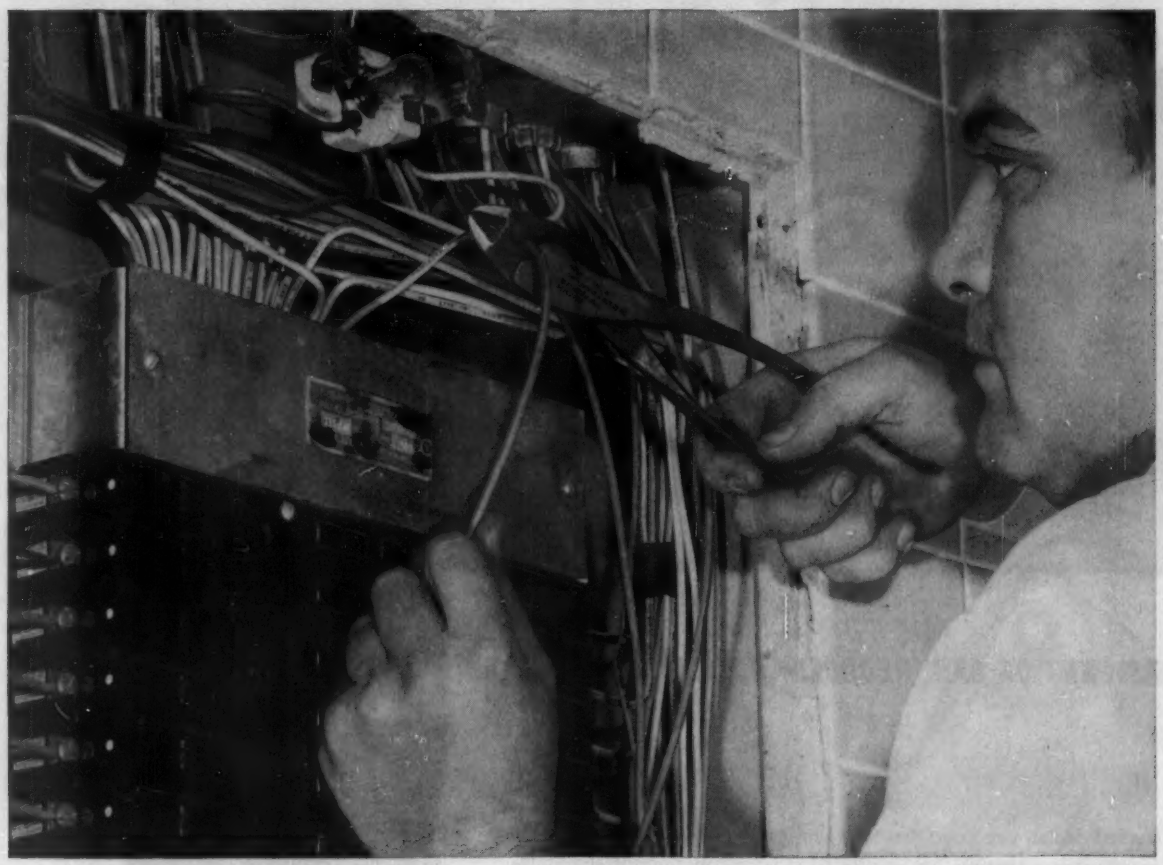
YOU CAN BE SURE...IF IT'S
Westinghouse

The new railroad car can support its load only six inches above the rails—two feet lower than on a depressed-center car. For this delivery, top clearance was sufficient to permit suspension a full foot above the rails.

Untight squeeze—loaded on the new car, this transformer for Ohio Power Company stands 19'2" above the rails; bridge clearance here is 20'4"; net, 14" top clearance. This allows direct routing, speeds delivery and construction schedules.

News about

B.F.Goodrich Chemical *raw materials*



For a lifetime of adequate wiring . . . ***insulation of Geon***

BUILDING wire insulated with Geon polyvinyl materials is playing a prominent role in today's adequate wiring movement for homes and buildings. And for good reason.

These materials have exceptional properties that give TW building wire many desirable features: smaller overall wire diameters are possible because of improved insulating ability; permanent fire resistance; resistance to acids, oils, alkalies, dampness, fungi and voltage breakdowns. Since Geon polyvinyl materials have exceptional aging characteristics, insulation maintains strength and flexibility.

Owners like the safety and dependable service these "Geon-insulated" wires provide through the years. Contractors prefer them for their good flex, clean stripping qualities, toughness, abrasion resistance and the ease with which they pull through studs, joists and conduits.

For information write Dept. GE-6, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

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In Lubricating Oil, too, there's no substitute for Quality!

"Look-alikes"—in lubricating oils as in oil paintings—can fool you. But they can't fool a machine. Famous Mobil oils prove this point.

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FIRST STEP IN CUTTING COSTS

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501 Kva Cluster-Mounted on One Pole..

Detroit Edison does it with 3 167-kva Featherweight POLE STARS

Here you see how Detroit Edison Company solved the problem of serving a small manufacturing plant without going to the trouble and expense of installing either a second pole and platform, or a vault.

Cluster-mounting of Featherweight Pole Star 167's can be an effective, economical way to provide power for shopping centers .... or to increase service to newly expanded commercial sections. Introduced by Pennsylvania in 1953, Featherweight Pole Stars "pioneered" the extension of pole mounting to 167-kva transformers. They have proved easy to handle, easy to install under all conditions . . . and linemen like the "slim" Pole Star design that encroaches so little on the climbing area.

Featherweight Pole Star 167's are available for pole mounting in every standard distribution voltage through 16,340 volts. Like all other members of the Pole Star line, they offer the long-range advantages of Pennsylvania's patented "lap-on-top"core.

Pennsylvania Transformer Division, McGraw-Edison Company, Box 330, Canonsburg, Pa.

Why Utility Engineers asked for this POLE STAR *transformer*

★ Will replace any single phase 75- or 100-kva pole-mounted transformer to provide 67% to 123% more capacity

★ Weighs less than 1500 pounds

★ Lower in overall height than average 100-kva transformer

★ Available in standard voltages up through 16,340 volts

Mechanical Characteristics

Weighs approximately 1500 pounds.
Conforms to EEI-NEMA Sixth Report.
Overall floor space slightly larger than average for 100-kva transformers.
Overall height approximately 8" less than industry average for 100-kva transformers.

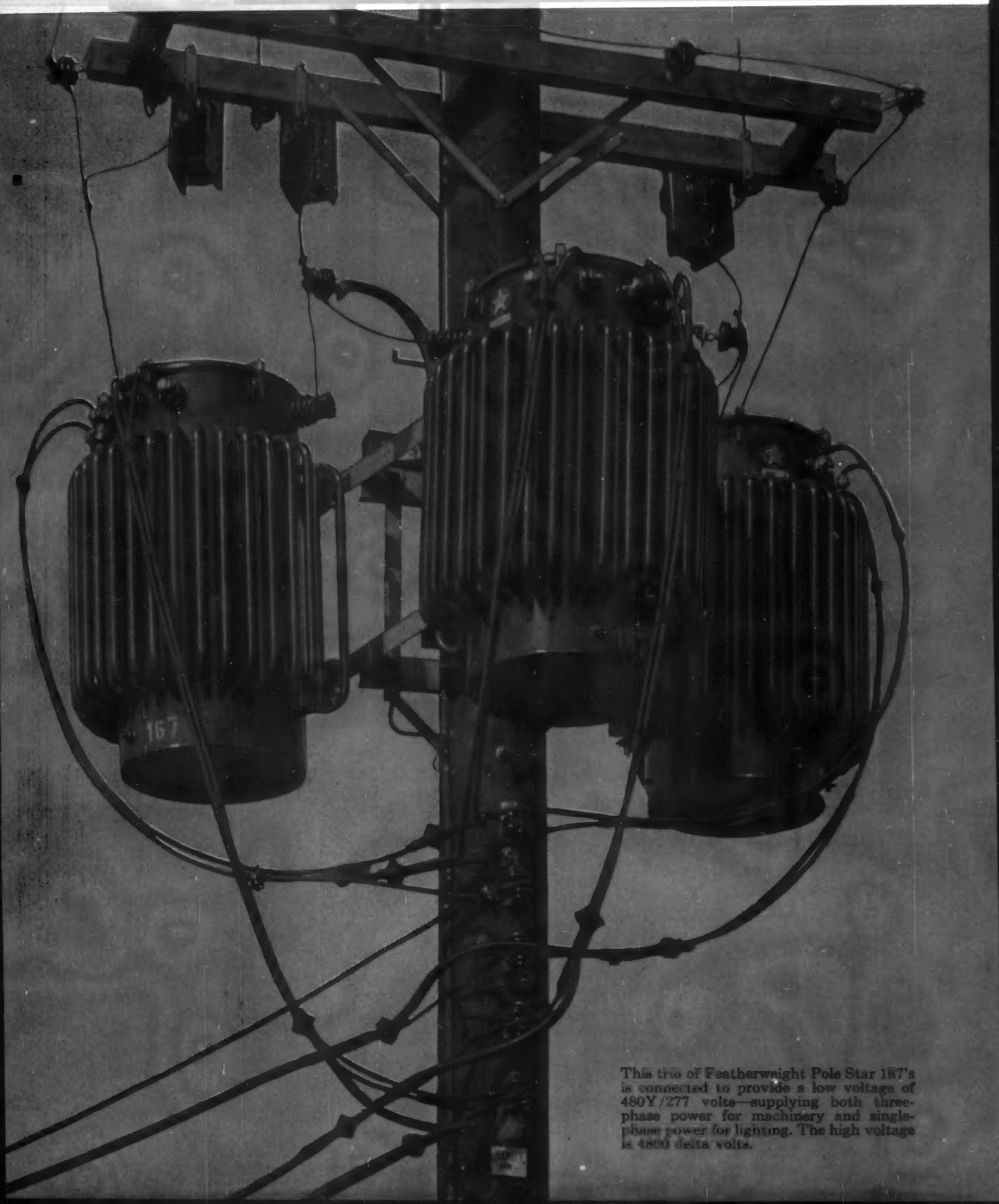
Electrical Characteristics

Patented "lap-on-top" Pole Star core, combined with effective coil design, results in low losses, low impedance, and good regulation.
Low exciting current found in all Pole Star designs also is inherent in the 167-kva Featherweight Pole Star.

McGRAW EDISON

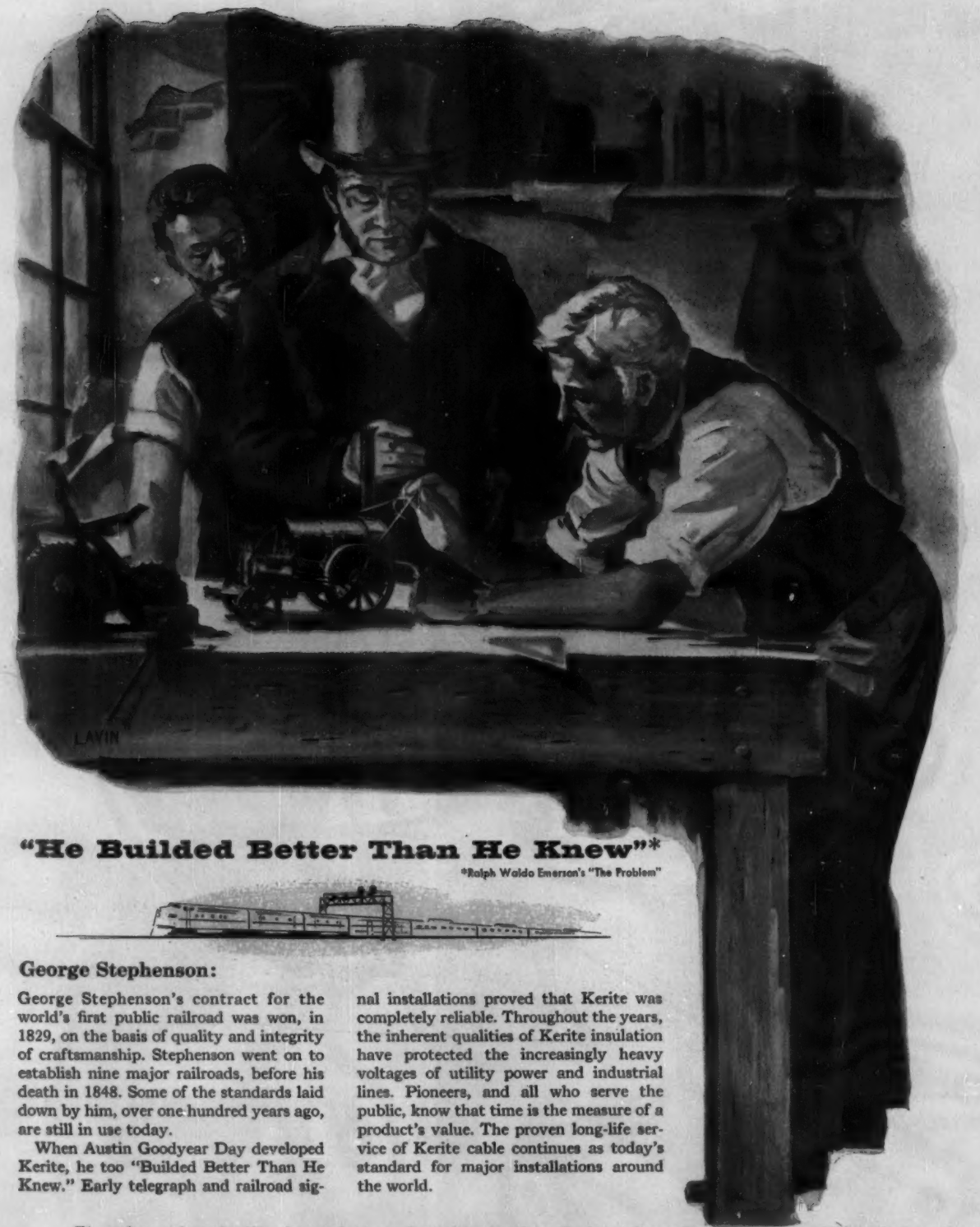
PENNSYLVANIA TRANSFORMERS pt

PENNSYLVANIA



This trio of Featherweight Pole Star 187's is connected to provide a low voltage of 480Y/277 volts—supplying both three-phase power for machinery and single-phase power for lighting. The high voltage is 4800 delta volts.

DISTRIBUTION TRANSFORMERS



"He Builded Better Than He Knew"*

*Ralph Waldo Emerson's "The Problem"

George Stephenson:

George Stephenson's contract for the world's first public railroad was won, in 1829, on the basis of quality and integrity of craftsmanship. Stephenson went on to establish nine major railroads, before his death in 1848. Some of the standards laid down by him, over one hundred years ago, are still in use today.

When Austin Goodyear Day developed Kerite, he too "Builded Better Than He Knew." Early telegraph and railroad signal installations proved that Kerite was completely reliable. Throughout the years, the inherent qualities of Kerite insulation have protected the increasingly heavy voltages of utility power and industrial lines. Pioneers, and all who serve the public, know that time is the measure of a product's value. The proven long-life service of Kerite cable continues as today's standard for major installations around the world.

The value and service life of a product can be no greater than the integrity and craftsmanship of its maker.

KERITE CABLE

THE KERITE COMPANY—30 Church St., New York 7, N. Y.
Offices also at 122 S. Michigan Ave., Chicago; 582 Market St., San Francisco;
3901 San Fernando Rd., Glendale 4, Calif.; 31 St. James Ave., Boston;
4101 San Jacinto, Houston 4, Texas; 1010 Euclid Avenue, Cleveland 17, Ohio;
29 West Lancaster Avenue, Ardmore, Pa.

Founded 1854

Rates For The Big Six Load Builders

The "All Electric Committee" idea, called for in our October 28 editorial, is gaining support from all quarters. But a fertile field for organized promotion of major load building appliances is not significant if the seed is not planted, cultivated and harvested.

The big six load builders—ranges, dryers, water heaters, space heating, freezers, and year-round air conditioning—can only be cultivated promotionally in an environment including appropriate rate schedules. Fortunately, a number of utilities have adjusted their schedules to provide the more attractive rates for the load building appliances. The latest of these adjustments was announced by Western Massachusetts Electric Co. They have a new rate schedule pricing all energy over 400 kwhr at 2¢ except for energy used in a special 7½-hr night-time period during which it drops to 1.3¢. Last summer Kansas Gas and Electric Co put a new rate in effect which permits electric heating at around 1.25¢ per kwhr. American Gas and Electric Co has held on to a 1.5¢ trailing rate for space heating.

We are hopeful that utilities who have not restudied their rate schedules and metering methods and adjusted them for the big six load builders will do so. For this kind of cultivation is essential to produce the environment in which an "All Electric Committee" can function effectively.

Cooperative Computer Centers Have Many Merits

Sputnik aside, virtually nothing has gone up so high so fast as investment in computers. From $10 million a year in 1953 annual investment has climbed to $100 million in 1956.

By mid-1957 there were over 4,900 computers of 103 difference types manufactured and in use by various organizations.

Computers have enjoyed a substantial and growing popularity among utilities for both accounting and engineering applications. But their use would be even wider today if first cost of units with capacity adequate for multiple application was within reach of more companies.

As matters stand nine of the 103 computers now available for research and commercial applications cost more than $1 million while 21 cost less than $100,000, according to a report of the Department of Commerce.

Would not the economic benefits of computer solution of complex problems be enjoyed by more utilities if neighboring companies were to share cost of a computer laboratory at a conveniently-located engineering college or similar institution?

Not the least of the resulting economies could spring from the sharing of programmed solutions to recurring problems.

It Doesn't Happen Often Enough!

We have a warm feeling for the little Louisiana town of Jennings as a result of something that happened there recently.

Usually its a queen, or a president, or a cowboy actor that gets the red carpet treatment from a city. But not in Jennings! No sir!

Last month the folks there threw an un-paralleled party called "Operation Appreciation" for 50 utility linemen and their wives. These were the men in 12 line crews from Gulf States Utilities Co and Southern Bell Telephone Co who worked 16 hours a day for 10 days to restore power and telephone service to Jennings when hurricane Audrey flattened the town last June.

So for two days Jennings turned itself inside out to show its appreciation. There were yacht cruises and picnics, parties and a big Louisiana Sunday dinner on the program.

Such reverse-English hospitality is heart warming indeed, and an all too infrequent compliment to linemen of the electric and telephone industries who, in times of disaster, spend their energies so unselfishly.

Stage Set for Snake Decision

Oral arguments end on Mountain Sheep-Pleasant Valley project. Delay ups estimated construction cost by $20 million

The Federal Power Commission has entered the final stage of deciding whether to give Pacific Northwest Power Co a license to build the Mountain Sheep-Pleasant Valley hydro project.

PNP filed for a license for the 1,500-Mw, $234-million project over two years ago. The project would be located just below the controversial Hells Canyon reach of the Snake River. The same groups fighting Idaho Power Co's Hells Canyon project also are pitted against MS-PV.

The issues were summed up for the commission during a one-day oral argument of the various parties before FPC took the matter under consideration. It may take from 30 to 60 days for the final decision.

PNP urged that the license be granted speedily because, said the company, the delay already has pushed up construction cost estimates $20 million.

Association Urges Nez Perce

The National Hells Canyon Assn told FPC it should recommend a federal Nez Perce dam lower down stream in place of the proposed company project. MS-PV would rule out Nez Perce.

Counsel for the association argued that PNP had not demonstrated financial feasibility of the project and that the "fish problem" could be solved, thus clearing the way for Nez Perce. It was charged that PNP was a combination of companies out to restrict production of electricity and increase electric rates in the Northwest.

PNP, in reply argued that its financing plan had nothing to do with feasibility. Even if this type of financing were not permitted the project would still be economically feasible, stated attorneys for the four privately owned electric companies that formed PNP.

The FPC staff adhered to its earlier position that the Nez Perce dam was preferable to MS-PV and that the commission should recommend that PNP undertake its construction.

The staff also said that the question of the financing plan was one for SEC to rule on. But if SEC finds the financing lawful, said the staff, then FPC can license the project.

Dick Nixon's Expanding Role

V. CRAIG RICHTER
Washington Correspondent

Richard M. Nixon has acquired new stature and status in the Administration, the most stark evidence occuring during Eisenhower's latest illness.

Nixon stepped in with more confidence this time, and people in authority in Washington were inclined to turn to the Vice President as the center of power.

Certainly Nixon stands out clearly as the leading Republican for the 1960 presidential nomination. Either as candidate or as a pinch-hitter, he will be conscious of the vote-getting picture he presents in the next three years.

Those familiar with Nixon from the time he has come to Washington believe he stands for much the same power policy—partnership, if you wish—that Eisenhower advocates.

Nixon has not been involved in any major power issue to the extent that he has stood out as a force. On the other hand, his role in support of partnership appears to be more than that of a dutiful subordinate. Nixon gives every indication he is an ardent believer in the concept.

What it adds up to is this: Nixon will oppose federal projects where he thinks private enterprise or local interests can do the job. He will support federal projects where there is no alternative.

Most Washington observers agree Nixon is a shrewder and much more of a politician than Eisenhower. Furthermore, as a Californian, he has an acute appreciation of water as the prime necessity in the semi arid West. In the past he has been intensely loyal to California's water interests. But, even so, he remained silent during the Upper Colorado project debate, a controversy in which California fought bitterly and lost to Eisenhower. Upper Colorado was one of his major achievements.

The question is raised whether Nixon the politician might not make power concessions to regional groups for the sake of political advantage. Such might be the case in the Northwest and far-West where Democrats still claim the last elections proved the unpopularity of partnership.

It appears more likely, however, that Nixon is far more worried about increasing federal power outlays.

For example, Nixon is an important source of growing Administration opposition to increasing rural electrification loan funds in the face of a declining percentage of farm electrification usage. An increasingly larger percentage of REA loan money today is going for electrification of small industries, commercial businesses, and non-farm residents rather than to farmers.

Nixon has more knowledge of domestic political affairs than Eisenhower. And from his record in the House and Senate it is evident that he knows and understands reclamation financing.

South Dakota Site Slated for Northern States Atom Plant

Contract signed with AEC for $28-million, 66-Mw plant. AEC will provide $6 million and waive fuel-use charges

A plant site northeast of Sioux Falls, S. D., is under consideration for Northern States Power Co's atomic power station. The company announced the tentative site after signing a contract late last month with the Atomic Energy Commission for the 66-Mw plant. Total cost will be about $28 million.

Prime contractor will be Allis-Chalmers Manufacturing Co. Pioneer Service & Engineering Co of Chicago will be architect-engineers for the project.

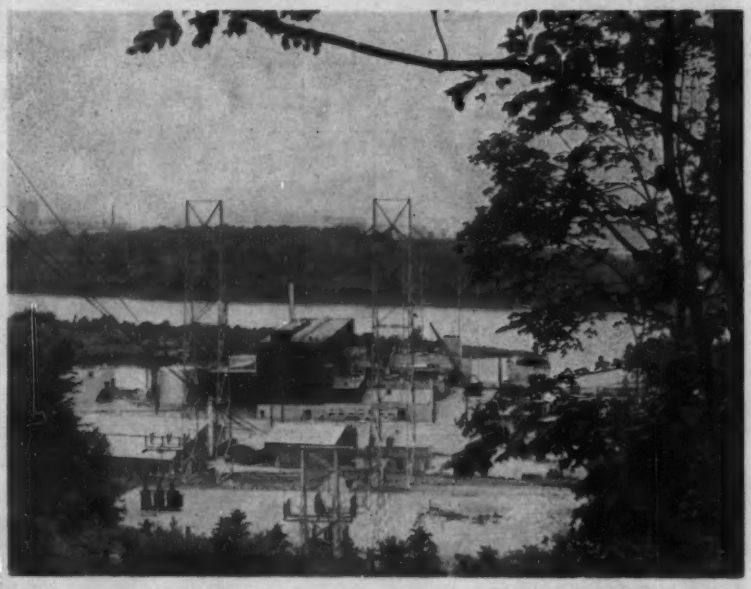
The contract provides for about $6 million assistance in research and development from AEC. For the first five years of operation, AEC will waive fuel-use charges up to a $1-million ceiling. These charges do not include cost of fuel burned, which will be paid by NSP.

A controlled re-circulation boiling water reactor fueled with slightly enriched uranium will be installed. The target date for operation is June, 1962.

NSP Pres Allen S. King said, "There is every indication we will meet our target date." The plant will be named "Pathfinder" to honor Gen John C. Fremont, explorer.

Ten Midwest utilities have joined with NSP to build the plant. The group will be called Central Utilities Atomic Power Associates. Some $3,650,000 will be contributed by the ten participants for research and development.

The ten companies are Mississippi Valley Public Service, Otter Tail Power, Interstate Power, Iowa Power & Light, Iowa Southern Utilities, Wisconsin Public Service, Madison Gas & Electric, Northwestern Public Service, St. Joseph Light & Power Co, and Central Electric & Gas.



Shippingport Goes Critical

This country's first full-scale nuclear power plant at Shippingport, Pa., went critical last week, three years and three months after ground was broken for the project. Criticality actually was achieved Dec. 2 at 4:30 AM.

The 60-Mw project is the result of the joint efforts of the Atomic Energy Commission, Duquesne Light Co, and Westinghouse Electric Corp. AEC financed the reactor portion and will own it. Duquesne contributed $5 million to the cost and also built at its expense the conventional generating equipment. It will operate the entire plant for AEC. Westinghouse designed and built the pressurized water reactor.

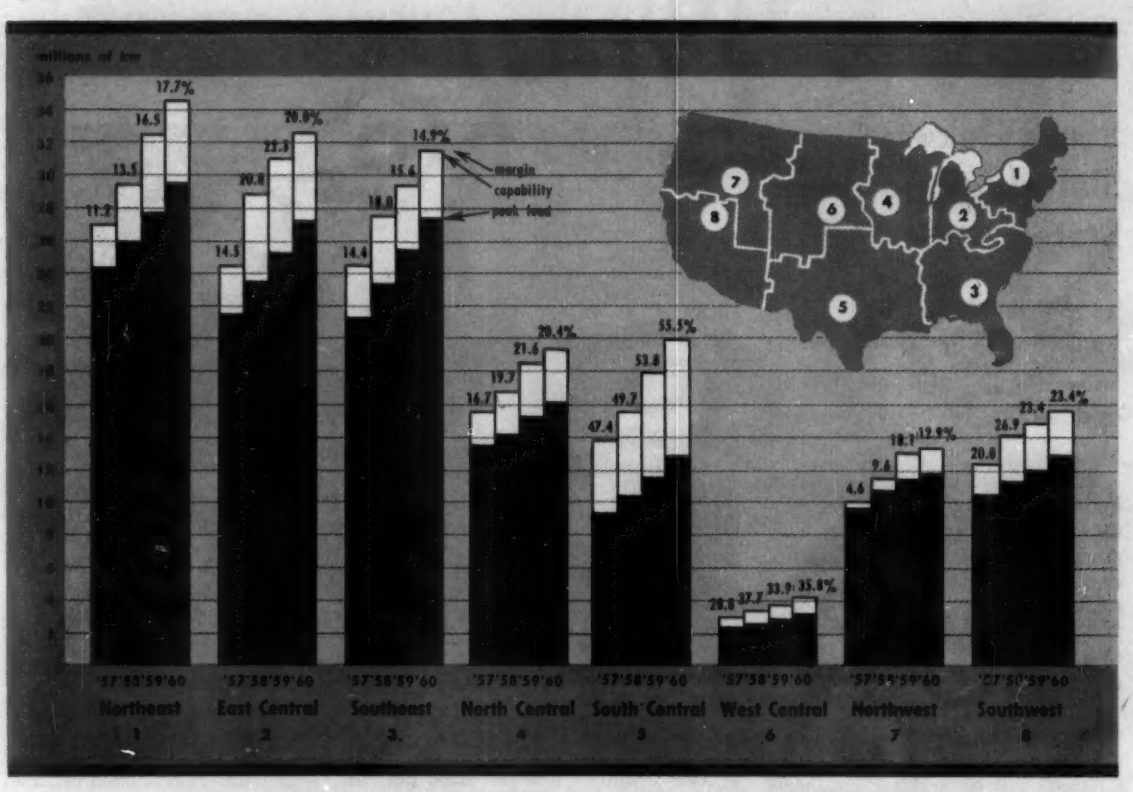
During the initial start-up test, the reactor operated at a power level of about 25 kw of heat. No electricity was generated. Tests will be made the next few weeks to determine nuclear characteristics of the reactor and establish satisfactory operation of components. Following these tests power will be increased gradually until full capacity is delivering electricity into the Duquesne system.

Including research and development, project cost is about $110 million, far higher than first estimated. Cost of power from first core loading is expected to be 65 mills/kwhr. This will be cut in subsequent core loadings.

NUCLEAR NOTES

Indemnity legislation as it applies to proposed AEC regulations has been the topic of a series of industry advisory conferences in Washington. The closed sessions, which conclude tomorrow, deal with a permanent AEC regulation to indemnify licensed reactor owners and others up to $500 million against claims based on nuclear accidents exceeding amounts of required private insurance.

Successful thermonuclear fusion reactions at Britain's Harwell facility have received the first indications of official confirmation. The leader of the House of Commons said the controlled laboratory experiments are leading the world.



On national scale, gross margins to hit 20.8% by December of '58 . . .

'57 Winter Peak May Take Growth

- **Estimated December peak shows 9.6% jump over last year's, EEI Power Survey says, while 1957 summer peak tops last year's figure by 8.9%**

- **Winter peak will still occur in 1960, but 1960's summer peak will be strongly contending for title of "champ"**

Despite the rapid growth of summer loads in various parts of the nation, this year's estimated December peak still appears to have grown slightly faster than the summer peak on a national scale.

But beginning with next summer, the situation is to reverse. Edison Electric Institute's 22nd Semi-Annual Electric Power Survey forecasts a more-rapid and certain growth for summer peaks through 1960.

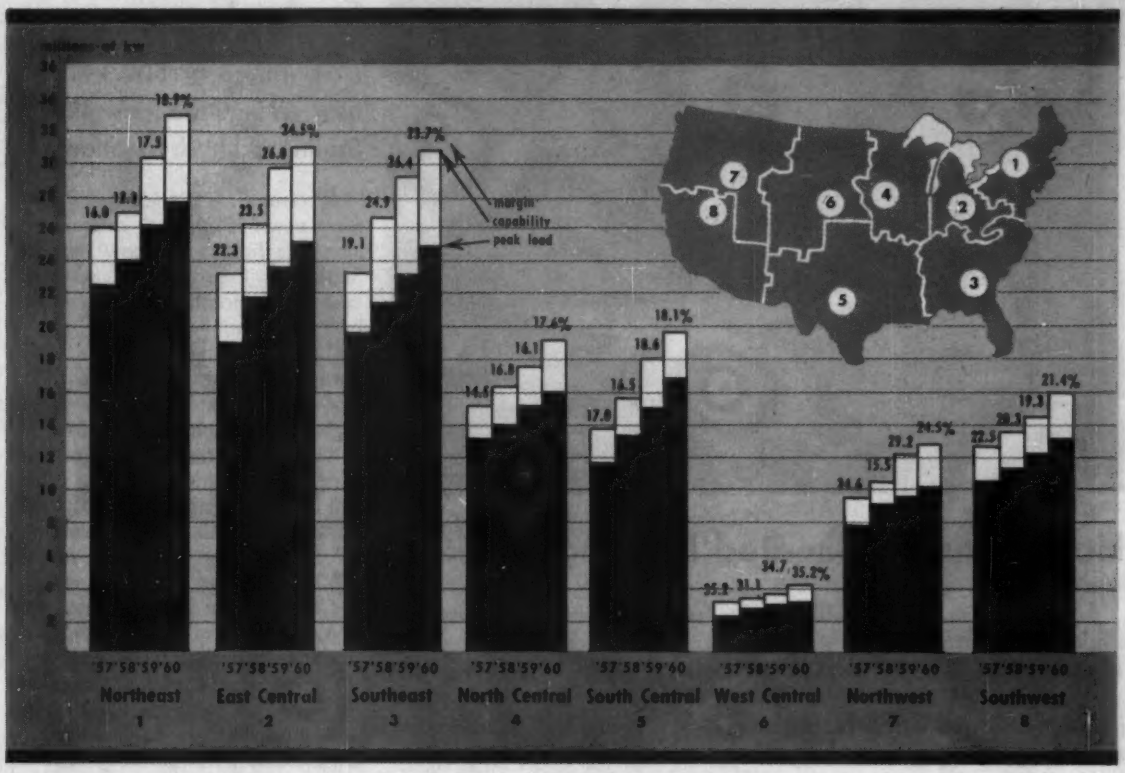
Right now the survey predicts a 1957 December peak 9.6% over last December's, and reports a 1957 summer peak growth of 8.9%. But recent reports indicate that the 9.6% figure may be optimistic. Furthermore, last winter's mild weather exaggerates this percentage. So it may be that last summer's peak actually grew faster than this winter's.

The predicted December peak for 1957 is 112,264 Mw, in comparison to last December's 102,444-Mw peak. This summer's peak was estimated at 106,740 Mw, in comparison to last summer's peak of 98,028 Mw.

Although the nation is not expected to hit a summer peak soon, warm weather demands definitely are predicted to grow faster than winter demands in the next three years. Growth, expressed as a percentage over the previous year, is expected to follow this pattern:

Year	Summer	Winter
1958	10.2%	9.1%
1959	8.6%	7.4%
1960	7.6%	7.0%

Predicted winter peak load for 1960 is 140,865 Mw in contrast to the predicted 1960 summer peak load of 137,372 Mw. So in 1960, the nation's peak still remains in winter. But the margin between national summer and winter peaks will have dwindled from 6,771 Mw (in 1955) to 3,493 Mw. This means that the



. . . while margins drop from 19.3% this summer to 19.1% next. Meanwhile . . .

Leap, Beating Summer's Gain

summer peak, which was 93% of the winter peak in 1955, will climb to about 97.5% of the winter peak by 1960.

In other quarters, the industry's outlook continues good. The EEI survey shows:

- Future capability will meet expected loads.
- Peak load will grow at an annual average increase of 7.6% between 1955 and 1960.
- Gross margins will improve steadily.
- Construction of new power projects currently is keeping abreast of schedules. Including 5,500 Mw installed by September of this year, 53,000 Mw are projected by 1960.
- Manufacturers' scheduled shipments in 1958 will top all previous records (see p 108).

Capability of electric power systems of the U. S. is estimated to reach 131,000 Mw at the end of 1957—up almost 7% for the year. The capability forecast for the end of 1960 is over 171,000 Mw, which represents an average annual increase from the end of 1955 of 8.2%. The survey indicates that, through the period covered, the scheduled rate of increase in capability will be adequate to accommodate the climbing peak loads, while maintaining at the same time satisfactory gross margins.

Winter Estimates Drop

With few exceptions, forecasts for December peak loads across the country for 1957 through 1960 are slightly lower than shown in the April (21st Semi-Annual) survey. "This continues the downward trend from the levels forecast a year ago at the time of the October 1956 survey," the text states.

Winter gross margin for the country as a whole is expected to run about 16.7%. Under median hydro conditions, the anticipated gross margin for December of 1958 is over 20%. Significance of these values may be altered in regions experiencing summer annual peaks.

A tight gross margin of 8.7% for the Pacific Northwest, predicted for this summer, failed to materialize. This is because summer peaks in general were somewhat lower than previously estimated, and capabilities were higher in some cases. As a result of a combination of these circumstances in Region VII, the actual 1957 summer gross margin was 24.6%, not 8.7%.

Under assumed adverse hydro conditions, however, gross margins for the West Division of Region VII are negative. But the statistics show that all firm load can be carried if interruptible loads are shed.

No significant trend or change was uncovered in load factors.

How Winners Handled Lighting – No. 2

Lighting like an artist's creation of a mosaic: This was Donald L. Roberts aim in his imaginative handling of a Scottsdale, Ariz., hotel. The job won a $100 first prize in the International Lighting Competition, which was co-sponsored by Electrical World (EW, Dec. 2, p 50). "Each area required its own pattern of light," the Arizona Public Service Co representative said. He used sharp contrast, for instance, on the entry-way with amber lamps lighting the stone pilaster, stake fence, and palm trees. Roberts made his sales presentation soon after learning no landscape lighting had been planned for the hotel. Before submitting the final plan, several units and various colored lamps were tested at the hotel. This was the clincher for both Roberts' choice of color and the owners' decision to buy the job. Incandescents are used throughout. Total connected lighting load is 18 kw.

Since 1946 Alfred C. Sangster of Detroit Edison Co has planned the lighting jobs for the architect with whom he collaborated on the hospital chapel below. "The work is frequently done in the architect's office with the lighting always being considered in the early planning," Sangster said. Perhaps this helps explain his winning of both first and second place in the competition's institutional category. The 3,010 sq ft chapel has indirect cove with tubular light source, recessed direct luminaires, and semi-recessed reflector lamp equipment. Switching is arranged so that either coves, recessed fixtures, or both may be lighted. Semi-recessed units lighting the altar and sanctuary are on separate controls. Connected load is 10.6 kw.

Soviet Line . . .

. . . will carry 500 kv on a new 625-mi Moscow link to Stalingrad hydro station

McGraw-Hill World News—Plans for a new 625-mi, 500-kv transmission line linking Moscow with the Stalingrad hydro station were revealed last month by the Soviet embassy in London.

The line is to consist of two-parallel 3-phase branches carrying 1,500 Mw. Rated capacity of the Stalingrad station is 2,300 Mw.

The embassy announcement said wires and lightning arresting cables will be suspended on 88½-ft pylons set at 500-yd intervals. Work on the line already has begun at both the Moscow and Stalingrad ends.

Current from the Stalingrad station will be generated next year and the first branch of the line is to be ready at the same time. Intermediate step-down substations on the line will supply power to hundreds of communities, the embassy said. It reported the line will have unique transformers, air circuit breakers automatically switching off sections of the line in case of short circuiting, and special devices to diminish power losses.

Details Given for 800-Kv

The announcement also gave further details of plans for the 800-kv line from Stalingrad to the Donbas coalfields and tne raising of the 400-kv Kuibyshev-Moscow line to 500 kv (EW, Sept. 30, p 62).

It said the 563-mi Kuibyshev-Moscow link has been operating more than 18 months. Decision to raise voltage is based on possible expansion of the Kuibyshev station's capacity, it was stated.

Reconstruction of the line will make it possible to transmit power to Moscow at 1,800 Mw instead of 1,350 Mw. It noted that the Stalingrad-Donbas line will be the connecting link between power stations of the Volga and the power grids of the south of the country.

The construction of extra-high voltage ac and dc lines "signifies the gradual implementation of the vast plan for establishing a single power grid for the Soviet Union," the announcement said.

Industrial Electrification Council polishes course to . . .

Beef Up Industrial Power Systems

Aimed at small and medium-sized industrials, sessions would update foremen and supervisors on benefits of modern distribution systems. Study is underway on process heating course

A seven-session course on industrial distribution systems, scheduled to start next year, is the newest program in the Industrial Electrification Council's activities. Supported by Edison Electric Institute and leading electrical equipment manufacturers, the course is designed for use at local levels by power companies, electric leagues, and similar groups.

Purpose of the program is to familiarize industrial customers with new distribution practice and point up savings of adequate electrical systems. Aimed at supervisors and foremen from small and medium-sized industries, the course will adapt successful techniques of the metal sheath heater course in use since 1954. Course materials include sound tracks, slide films, sales promotion pieces, and an industrial supervisor's handbook.

Distribution Makers Invited

With the course as a background, industrial customers can better use facilities of contractors, equipment makers, and utilities in improving distribution systems. Invitations to share in the program are being extended to manufacturers of distribution equipment.

Now that plans are underway, Duquesne Light Co's R. R. Johnson, chairman of industrial distribution steering committee, enthusiastically says, "I am convinced there is a tremendous need for greater understanding by management concerning the various phases of a good electric power distribution system for their industrial plants. Through the course, I think we have found the means of filling that need."

The course is the second major program of the Industrial Electrification Council, which celebrated its sixth birthday last month. Coordinating promotion efforts of 95% of U. S. power companies and more than a score of leading electrical manufacturers, IEC helps add thousands of kw to utility loads, keys off big surges in sales of participating manufacturers.

Nation-Wide Idea Exchange

Its informal local and national meetings give representatives of thousands of industrial customers a fund of practical electrical know-how. The biennial National Industrial Heating Conferences have become a nation-wide forum for interchanging new techniques and sales ideas.

Heavyweight of IEC's accomplishments to date is the metal sheath heater course. Since September, 1954, it has been used by 37 major utilities. More than 10,000 industrial customer employees have participated, with typical attendance records over 80%.

Designed to cover theory and application of low temperature electric heat in six two-hour sessions, its main purpose is to inform industrial personnel of potential application areas and of equipment types that can be used for each application. A second function is to train utility salesmen, manufacturers' representatives, distributors, jobbers, and contractors to correctly apply metal sheath heaters. The course includes a film kit, instructor's guide, conferees textbooks, and varied heating equipment for demonstrations.

Typifying the results is the utility which got 143 new jobs from 277 participating plants in the month after the course. Total load increase was 5,300 kw. On the manufacturers' side, sales gains of 25% and more came in areas where the course was given.

An outgrowth of the heater course was a contest for industrial participants. "How I Switched On Electric Heat" offered prizes of $200, $100, and $50 for reports of installations made as a result of know-how gained. Competition was handled by sponsoring utilities.

Heating Conference Catches on

Another council achievement is the biennial National Industrial Heating Conferences in Cincinnati. Object: To furnish further industrial heating training for power sales engineers, and provide an information exchange between manufacturers and utilities on the latest devices and sales aids.

The first week-long conference drew 220 participants representing 57 utilities and 39 manufacturers. Agenda for the 1958 conference, to be held Feb. 3-6 at the Netherland-Hilton Hotel, includes heat treating, metal sheath heaters, comfort and process heating, sales aids, furnaces, and convection and radiant heating.

Co-chairmen are West Penn Power Co's F. F. Dickman and R. W. Wyman, Cleveland Electric

Illuminating Co. Reports Dickman: "Early indications point to a record participation . . ."

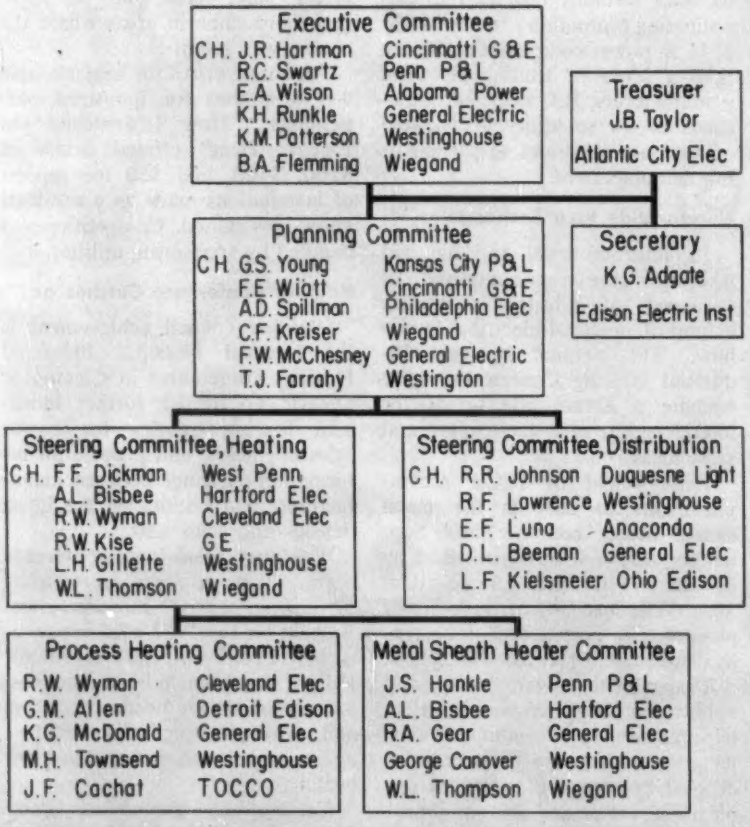
In the planning stages is a series of programs on types of process heating. Available as individual sessions fitting local utility needs, they will be organized for easy presentation to groups of industrial customers. Supervising the program is the industrial electric heating steering committee, headed by Dickman. Tentatively scheduled for coverage are surface heat treating; brazing; soldering and sintering; annealing and tempering; isothermal treatments; solution heat treating; vacuum techniques; surface coating; hot forming; and through-hardening.

An EEI brainchild, the council is a voluntary organization of utilities and manufacturers that coordinates national education and promotional work of the two groups. George E. Whitwell and Maxwell Cole, both of Philadelphia Electric Co, sparked the first program.

The council's function, succinctly phrased by Kansas City Power & Light's G. S. Young, planning committee chairman, is to "provide a grass roots method of bringing to industrial plant personnel information about electrical equipment and its applications, information that is readily usable in making more profitable use of electric service."

Responsibility for policy and financial decisions rests with the executive committee, headed by Cincinnati Gas & Electric Co, Vice President J. R. Hartman.

Surveying the council's progress and potential, Hartman says, "The coordination that results from focusing attention of utilities and manufacturers on problems of mutual interest increases the effectiveness of their respective sales program. The council can prepare educational programs without the use of trade names, thus permitting any group in the industry to use them without fear of criticism."


Executive Committee
CH. J.R. Hartman — Cincinnati G&E
R.C. Swartz — Penn P&L
E.A. Wilson — Alabama Power
K.H. Runkle — General Electric
K.M. Patterson — Westinghouse
B.A. Flemming — Wiegand
Treasurer
J.B. Taylor
Atlantic City Elec
Planning Committee
CH. G.S. Young — Kansas City P&L
F.E. Wiatt — Cincinnatti G&E
A.D. Spillman — Philadelphia Elec
C.F. Kreiser — Wiegand
F.W. McChesney — General Electric
T.J. Farrahy — Westington
Secretary
K.G. Adgate
Edison Electric Inst
Steering Committee, Heating
CH. F.F. Dickman — West Penn
A.L. Bisbee — Hartford Elec
R.W. Wyman — Cleveland Elec
R.W. Kise — GE
L.H. Gillette — Westinghouse
W.L. Thomson — Wiegand
Steering Committee, Distribution
CH. R.R. Johnson — Duquesne Light
R.F. Lawrence — Westinghouse
E.F. Luna — Anaconda
D.L. Beeman — General Elec
L.F Kielsmeier — Ohio Edison
Process Heating Committee
R.W. Wyman — Cleveland Elec
G.M. Allen — Detroit Edison
K.G. McDonald — General Elec
M.H. Townsend — Westinghouse
J.F. Cachat — TOCCO
Metal Sheath Heater Committee
J.S. Hankle — Penn P&L
A.L. Bisbee — Hartford Elec
R.A. Gear — General Elec
George Canover — Westinghouse
W.L. Thompson — Wiegand

INDUSTRIAL ELECTRIFICATION COUNCIL organization includes utility and manufacturer representatives on each committee. Chairmen generally are utility men.

Sputnik Fears Endanger Atom Technology–Knapp

Satellite hysteria in Washington might mislead Congress into plunging the government into a crash atomic power program, Sherman R. Knapp, above, warned recently.

Knapp, president of Connecticut Light & Power Co, declared that forcing the Atomic Energy Commission to start immediately building large-scale plants would require most technical talent now engaged in the present long-range nuclear program. "This would mean a setback of at least five years and a clear loss of our present lead in atomic power technology," he predicted.

A federal atomic program would also require billions of dollars that might be better spent on the missile program, "where recent developments indicate that that wholly government undertaking has been too little and too late," he noted.

Knapp spoke to more than 100 representatives of communications media at a recent celebration of Connecticut L&P's 40th birthday.

Federal Pacific Acquires Firm

Federal Pacific Electric Co of Newark, N. J., will acquire all outstanding common stock of Roller Smith Corp, Bethlehem, Pa., in exchange for 25,000 common shares of Federal Pacific. This action was taken last Monday at a Federal Pacific stockholder meeting. Roller Smith makes instruments, oil and air circuit breakers, and switchboards.

Controversy in Cleveland

The overhead vs. underground controversy is gradually growing into a major issue in Cleveland and its suburbs, and may result in a re-examination of the whole question.

The town of Euclid opened the attack last fortnight by objecting to Cleveland Electric Illuminating Co's proposal to build 132,000-v overhead lines along the N. Y. Central Railroad in Euclid. It contends a local ordinance passed in March would require underground installation and that CEI's proposal is an "unhappy example of a private utility's disregard for public welfare." The cost for overhead lines would be $900,000; for underground, about $4 million.

Cleveland itself followed suit by turning down CEI's plan to string a 132,000-v power transmission line in the city. The third town to voice its objections is Independence, where a CEI-proposed 66,000-v transmission line was to serve the Republic Steel Corp facilities now being constructed.

Court proceedings begin today with a mandamus action.

Plug-In Protection

Sputnik and possible Russian intercontinental missiles have spurred Civil Defense Administration efforts to develop and test a "simple home warning device that can be plugged into any electrical outlet." CDA's goal: a workable device "that is served by a central power system."

But Neither Snow nor Sleet...

As winter sets in throughout the nation, frigid weather, snow and rain storms, and gale force winds have begun their annual "lights out" campaign against utilities.

In Philadelphia's suburbs, an early freeze snapped a 39,000-v line, causing a 26-minute blackout in over 6000 homes.

In the Los Angeles area, a severe gale and dust storm scattered hot wires over the streets, sidewalks and yards, causing wide-spread damage. In one section, a station was knocked out for over seven hours; in another, three 23,000-v lines fell, halting traffic.

In New Mexico's Jemez River area, a series of snow and rain storms caused a record flash-flood and disrupted power service. Power blackouts affected distribution systems of Jemez Mountain Electric Co-op, which had several miles of transmission lines blown down, and Chama Electric Co-op. It was expected to take weeks to complete permanent repairs.

And in Florida, not the weather, but a fat possum was responsible for an hour-long blackout in northwest and northeast Miami. The animal had crawled into a switch at Florida P&L's Little River substation.

High Stake for High Schools

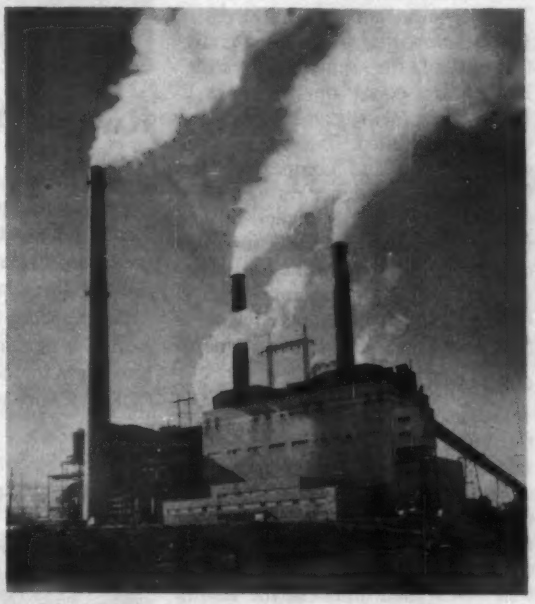
A $500 college scholarship is top prize being offered by Portland General Electric Co in its current "Electricity at Work" contest for high school students.

The competition, which centers on exhibits demonstrating applications or principles of electricity, is open to students in the 62 schools in PGE's area.

Windfall for Clatskanians

A month's free electric service was delivered to the 1700 customers of Clatskanie Peoples Utility District this November for the second year.

The debt-free system serves the vicinity of Clatskanie, Mayger, Westport, and Wauna, Ore. Its average rate for residential service is 8 mills per kwhr.



Ohio Power Rolls New Unit

A 225-Mw generating unit at Ohio Power Co's Muskingum River Plant was placed in commercial service last week. The addition, Unit 3, raises plant capability to 655 Mw. Unit 4, an identical turbine-generator, will go on the line early next year. Estimated cost for the two machines is $57 million.

The construction is part of a five-year $800-million program of American Gas & Electric Co, parent company of Ohio Power and electric utilities in a seven-state system. By 1960, AG&E's capacity will hit 6,365 Mw.

Pennsylvania Electric Association hears . . .

Gas-Filled Transformers Vie With Oil-Filled

Advances in design should make gas-filled power transformers more competitive with conventional oil-filled units, C. B. Faubion, General Electric Co, told the Electrical Equipment Committee, Pennsylvania Electric Association, at Philadelphia, Nov. 14-15. Transformers using SF_6 as an insulating and cooling medium compare favorably in electrical and mechanical characteristics with oil-filled transformers, and the former can be built for any theoretical load or voltage ratings, he said.

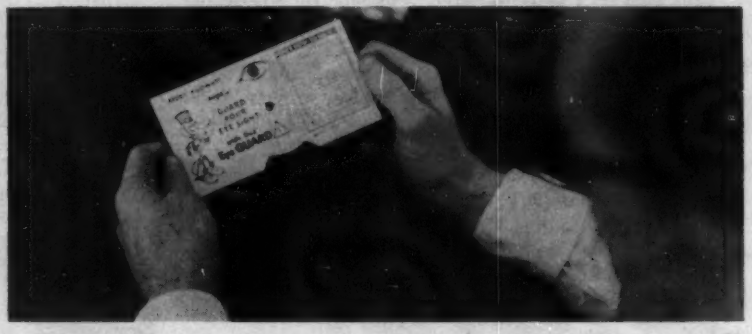
Present standing of gas-filled transformers was summed up by Faubion through several comparisons. For ratings above 20,000 kva, they compare in size with oil-filled transformers, yet have an overall weight reduction of 20 to 30%. Their core noise can be reduced by 10 db below that of oil-filled transformers of the same kva rating. Losses are equal or higher in a 12.5-Mva gas-filled unit compared with an oil-filled unit at its fan-cooled rating and comparable for transformers of higher ratings. The gas-filled unit has a higher 60-cps impulse strength for the same BIL rating, but has 80% of the insulating strength of oil and operates with a 65C winding rise compared with a 55C rise for oil-filled transformers.

Other Factors Give Edge

Other factors tend to give the gas-filled transformer an economic edge, said Faubion. These are elimination of equipment for handling and storing oil and of equipment and structures for guarding against fires; and ditches and sumps can be dispensed with. Gas-filled units cut the length of bus duct required at power stations, reducing initial costs and operating losses. Load-tap-changing equipment has been developed for gas-filled units in the lower ratings, as well as gas-filled bushings up to 69 kv which meet all ASA standards.

Several more transformers up to 75,000 kva will be protected by high-speed ground switches on the Pennsylvania Power & Light Co system, said F. R. Licini. The first two installations were made partly because of a lack of communication circuits (EW, Oct. 21, p 56). The later installations were prompted by favorable economics and overall operating performance and despite the availability of communication channels for tripping breakers.

Except for gas leaks in pressure switches on the initial gas-filled (SF_6) switches, no maintenance has been required during two years of service. Licini said that the ground switches were not called upon during this time to ground the line to remove the transformers. One modification includes the addition of a second pressure switch which alerts an attended station when gas pressure drops to 18 psig.

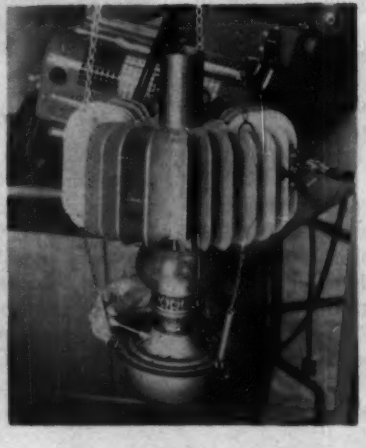


Reddy Arms for Better Lighting

A militant Reddy Kilowatt, armed with a simple light measuring device, is catching on quickly with utility companies and their residential customers. Reddy Kilowatt, Inc, says its "Eye Guard" has brought enthused response.

Home owners hold the device at customary reading levels to check if lighting levels are adequate. They simply turn a wheel that is keyed to a specific seeing task. If they're checking lighting adequacy for cards and games, for example, they spin the wheel to No. 1. This puts a shaded "OK" into view in the eye-shaped window. When it strains the eye to see the "OK", Reddy advises a larger light bulb.

Kerosene Lamps Power Russian Radios



Kerosene lamps that do double duty by producing small amounts of electrical current as well as light are in production in the Soviet Union. The lamps are for trappers and others stationed in remote areas.

Described as "a first cousin to a thermocouple," the device is estimated to have less than 1% efficiency. It employs the Joule effect with copper and aluminum junctured at different points in series on the inside. The differential of about 570 deg internal and 90 deg external temperatures creates an electromotive force of approximately ½ watt.

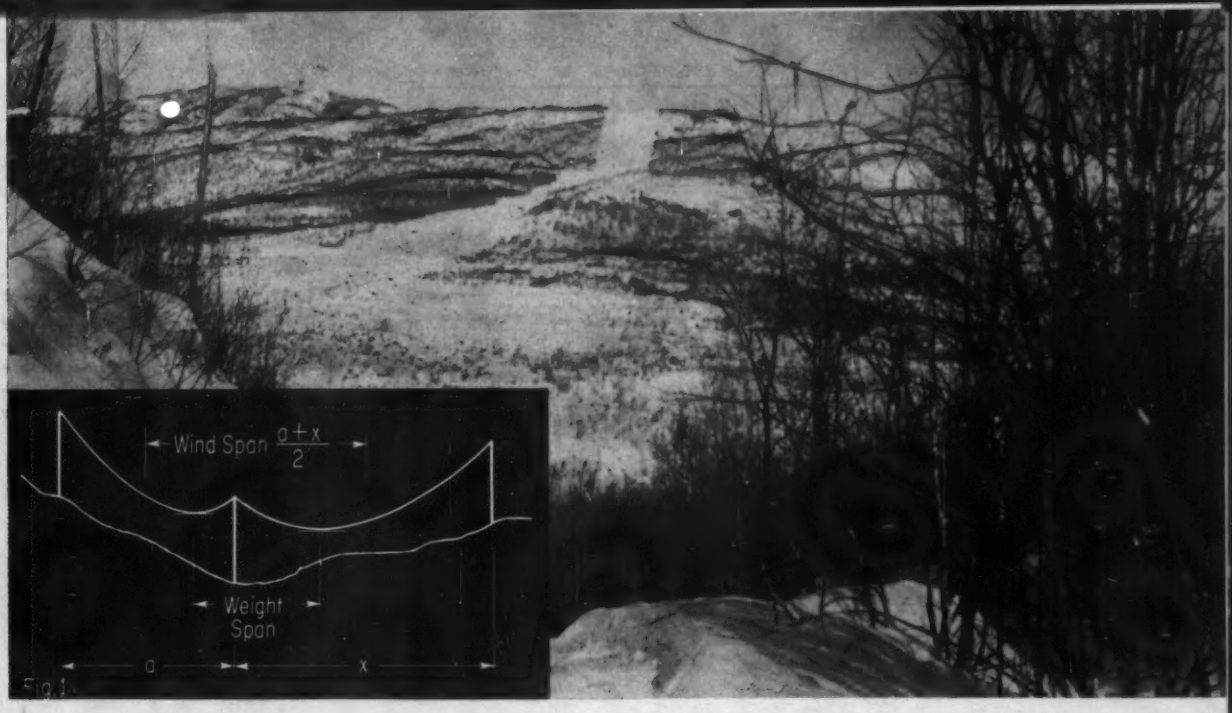


Fig. 1

Design Problem: How to Maintain Tower Clearances at Low Temperature

New technique is a simple solution to the problem of designing a transmission line for operation at —50F in hilly terrain

H. B. WHITE, Power Transmission Engineer, Aluminum Company of Canada, Ltd, Montreal, Canada

A new technique has been used succesfully to determine the sag and tower-loading conditions of transmission lines over hilly terrain in climates as extreme as —50F. It offers a simple solution to the problem of checking electrical clearances from conductors to towers where very low temperatures produce increased angles of swing of the suspension strings.

The reduced clearance causes outages or frequent flashovers. When the condition is extreme, uplift on the suspension string can cause physical damage to the conductors, insulators, or hardware. It is difficult to locate all possible sources of trouble, but in general the problem arises with towers at the bottom of a hill.

A decrease in temperature causes a contraction of the conductors and reduces the vertical or weight span on the tower. If the tower carries a small line angle or the conductors are subjected to a cross wind, these horizontal forces may be sufficient to produce an excessive angle of swing when working against the reduced vertical load.

As the line angle and wind span do not change with temperature, it is necessary to find only the revised weight span at the low-temperature condition to check whether excessive swing will occur. This is normally done by reviewing the sags on the profiles, using a cold temperature template and measuring the new weight spans.

The new approach to this problem, however, utilizes a one-line nomograph which does away with the low-temperature template. Furthermore, this technique requires no measuring other than the determining of weight span and wind span at maximum sags.

Before investigating this method of determining low-temperature sag, it is necessary to explain the general theory and application of the tower loading chart.

This explanation calls for the definition of two terms: Weight span and wind span (Fig 1). The weight span on a tower is the horizontal distance between the low points of adjacent spans. The wind span, those parts of adjacent spans that contribute to the wind load on the tower, is equivalent to half the sum of the lengths of adjacent spans.

Tower Loading Chart Aids Design

The tower loading chart is used in the design of a transmission line for very hilly terrain, where it is sometimes difficult to determine the minimum class of tower for each position.

Fig 2 shows a loading chart for this company's type "B" tower. It is designed to carry vertical loads produced by a weight span up to 3,000 ft and transverse loads by a wind span of 1,600 ft, combined with a line angle of 3½ deg. The tower can, of course, carry

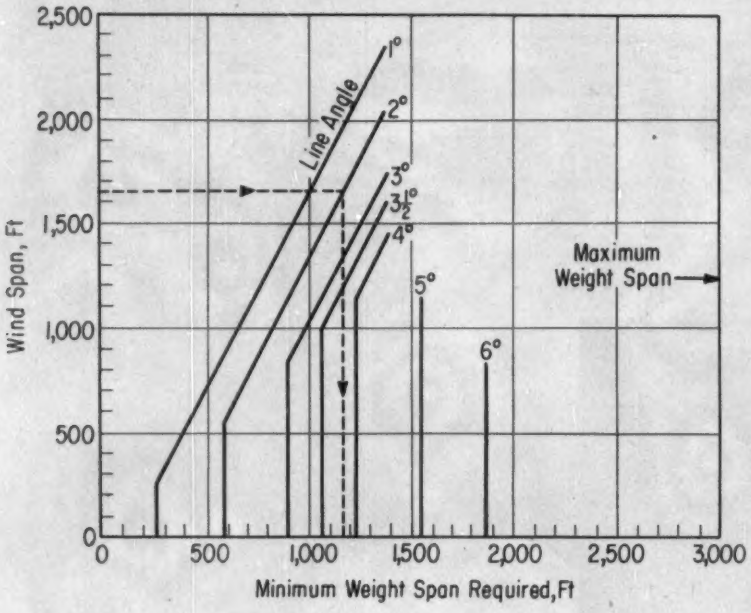


FIG 2—TOWER LOADING CHART is used in designing line for very hilly terrain, where it is sometimes difficult to determine minimum class of tower for each position. This loading chart is for Alcan's type "B" tower

any other combination of wind span and line angle resulting in transverse loads not exceeding the above.

The minimum conductor-to-tower clearances for "no-wind" and "wind" loadings are on the electrical clearance diagram for the "B" tower (Fig 3). As the tangent of the angle of swing is a function of $\frac{\text{horizontal loading}}{\text{vertical loading}}$, it follows that if the angle of swing for the no-wind loading position is not to be exceeded, the minimum weight span required is a function of $\frac{\text{line angle}}{\tan 20\ \text{deg}}$. For wind loading it is a function of $\frac{\text{line angle \& wind span}}{\tan 45\ \text{deg}}$.

When these minimum weight spans are not obtained, electrical clearances to the tower will be impaired. In this event, the next class of tower should be used or suspension weights added to compensate for the lack of weight span. Or, the situation might be rationalized—for example, if the line runs through a valley, there may be little possibility of experiencing the full design wind load on the entire wind span.

The maximum combination of wind span and line angle permitted is indicated by the upper extreme of the degree lines on Fig 2. The sloping part of the lines represents the limits set by the clearances to the tower under wind loadings; the vertical portion of the lines, the clearance under no-wind loading.

As an example, the adequacy of a tower with a 1,650-ft wind span, a 2-deg line angle, and a 1,200-ft weight span can be checked on Fig 2. A required mini-

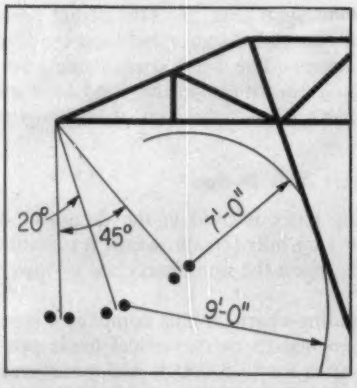


FIG 3—DIAGRAM shows minimum "wind" and "no-wind" clearances

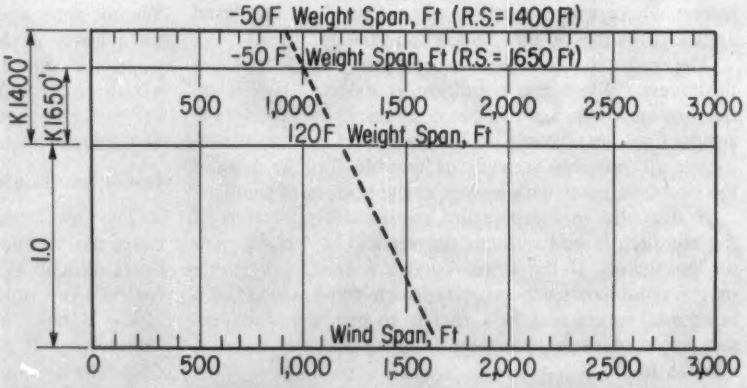


FIG 4—NOMOGRAPH solves special problem which arises where low temperatures contract conductors, reducing the weight span of a tower at bottom of hill

mum weight span of 1,160 ft is determined by entering the chart at the wind span (dotted line), moving horizontally to the line angle, and then vertically to the weight span. Thus, a "B" tower is found to be adequate.

This example is a conventional application of the chart. A special problem arises where very low temperatures contract the conductors, reducing the weight span of a tower at the bottom of a hill. The new technique can solve this problem simply and accurately.

For the purpose of this discussion, assume that maximum sags occur at 120F and minimum sags at —50F, although any other conditions producing maximum and minimum sags can be used.

To solve this sag problem, first, the wind span and weight span at 120F are determined. Then, the change in weight span from 120F to —50F can be computed as equal to K x (wind span — weight span at 120F), where

$$K = \frac{\text{ruling span sag at 120F} - \text{r.s. sag at } -50\text{F}}{\text{ruling span sag at } -50\text{F}}$$

This problem can be worked on a simple nomograph (Fig 4) on which three lines representing wind span, weight span at 120F, and weight span at —50F are spaced in the ratio of 1:K. For each different ruling span it is necessary only to recalculate K and draw a new upper line.

The nomograph reveals that the tower in the example, with a wind span of 1,630 ft and a weight span of 1,200 ft at 120F, will have a weight span of only 930 ft at —50F. Thus, suspension weights equal to about 230 ft of span must be added to bring the total to 1,160 ft.

Derivation of this method is shown in Fig 5. Based on the parabolic formula, it reflects any inaccuracies in the parent formula.

The technique can be refined by allowing for the increase in conductor tension at low temperature. This factor will magnify the effect of the line angle on the transverse loading of the tower and on the angle of swing of the insulators.

This method was used successfully to determine the low-temperature sag conditions for two single-circuit 345-kv, 90-mile lines employing a bundle of two 850-MCM 45/7 ACSR conductors. The lines, when completed in mid-1959, will connect a new underground 1-million-hp generating station at Chute-des-Passes, with smelter facilities in the Lake St. John area.

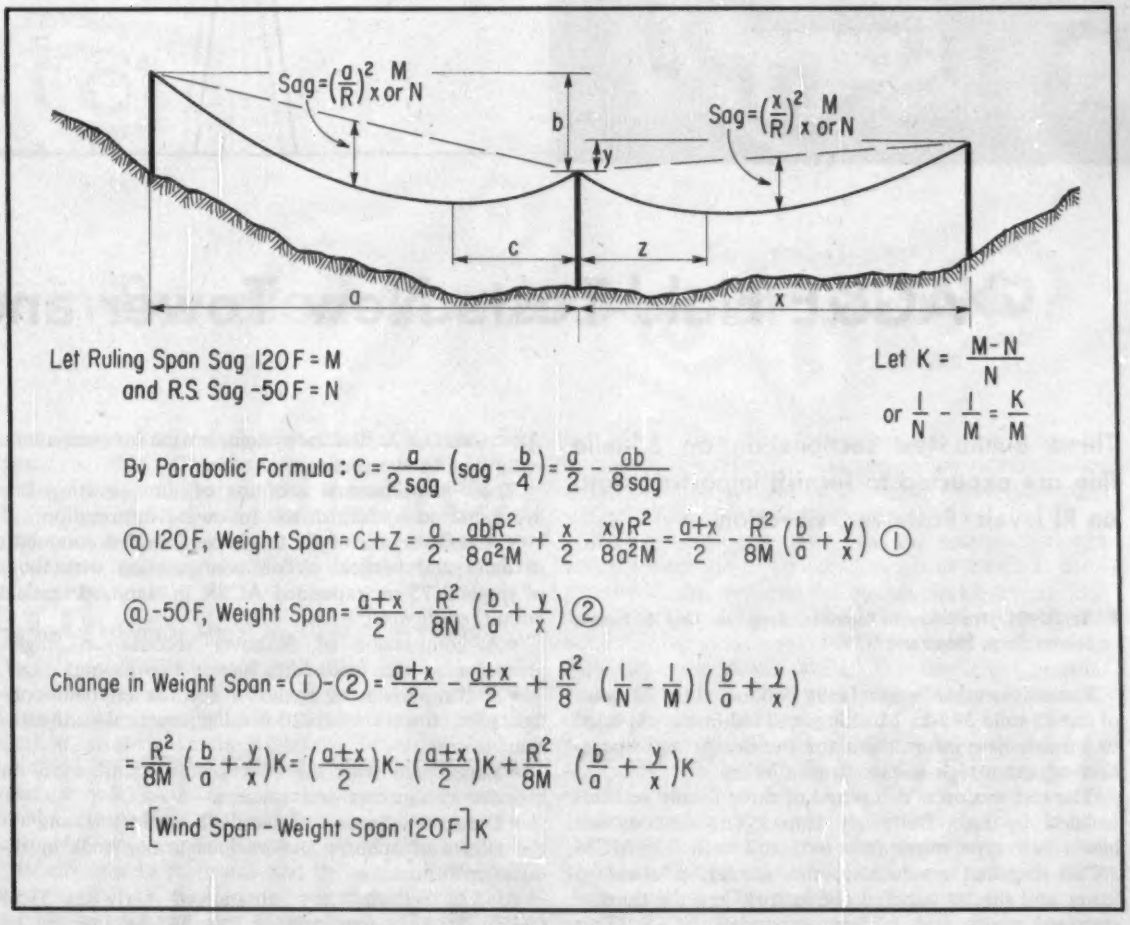
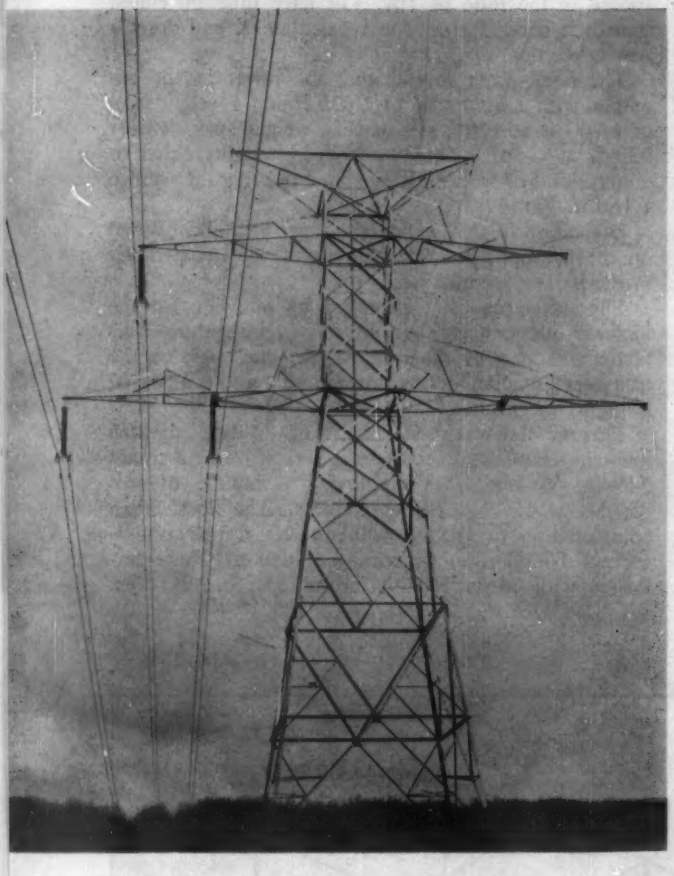
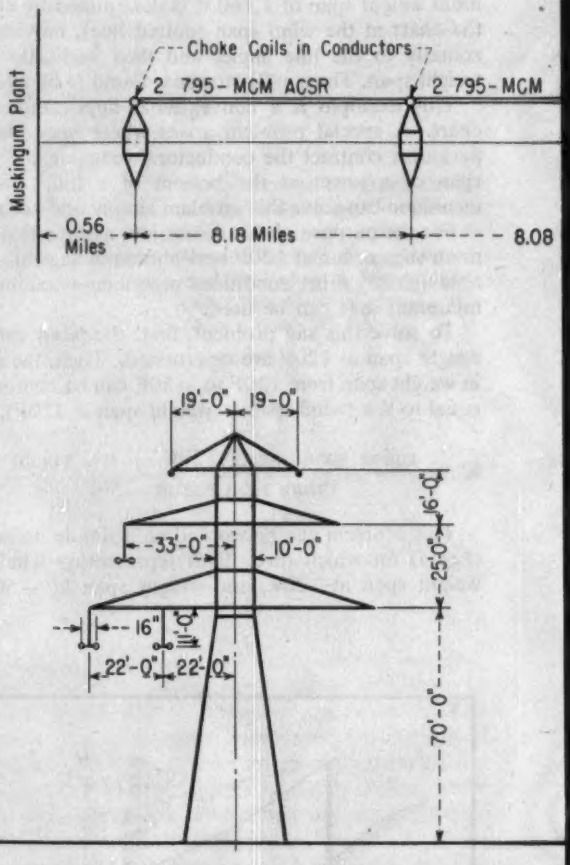

Sag = (a/R)² M x or N
b
y
Sag = (x/R)² M x or N
c
z
a
x
Let Ruling Span Sag 120F = M
and R.S. Sag -50F = N
Let K = (M-N)/N
or 1/N - 1/M = K/M
By Parabolic Formula: C = a/2 sag (sag - b/4) = a/2 - ab/8 sag
@ 120F, Weight Span = C+Z = a/2 - abR²/8a²M + x/2 - xyR²/8a²M = a+x/2 - R²/8M (b/a + y/x) ①
@ -50F, Weight Span = a+x/2 - R²/8N (b/a + y/x) ②
Change in Weight Span = ① - ② = a+x/2 - a+x/2 + R²/8 (1/N - 1/M)(b/a + y/x)
= R²/8M (b/a + y/x)K = (a+x/2)K - (a+x/2)K + R²/8M (b/a + y/x)K
= [Wind Span - Weight Span 120F] K

FIG 5—SOLUTION used in nomograph is based on the parabolic formula. It reflects any inaccuracies in parent formula





AG&E Field-Tests New Tower and

Three 8-mile test sections on an 85-mile line are expected to furnish important data on RI levels, flashover, vibration

E. S. ZOBEL, Transmission Engineer, American Gas & Electric Service Corp, New York, N. Y.

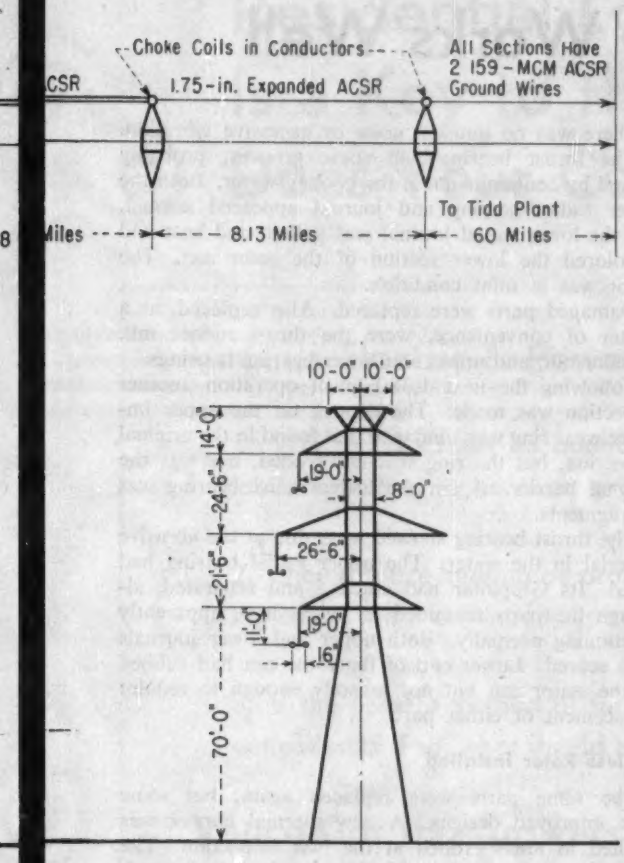
Extensive research now being conducted on 24 miles of the 85-mile 345-kv Muskingum-Tidd line is expected to furnish new information for the design and operation of extra-high-voltage transmission.

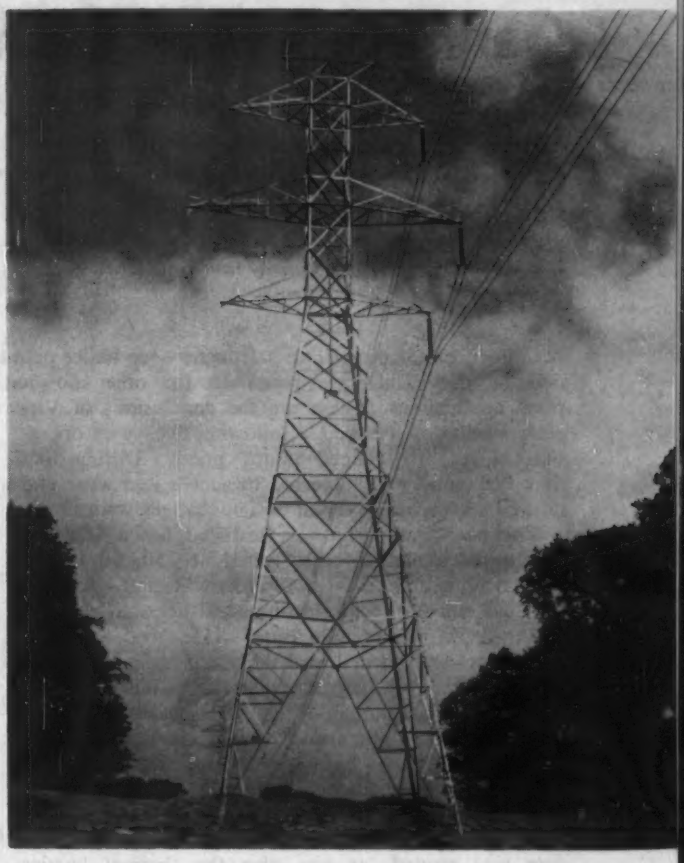
The test section is composed of three 8-mile sections isolated by radio-frequency traps. The first section has a new type tower (top left) and twin 795-MCM ACSR bundled conductors, the second, a standard tower and similar bundled conductors; and the third, a standard tower and 1.75-in. expanded ACSR. This third section, similar to existing 345-kv lines on the American Gas & Electric system, is used for comparison with the first two sections.

These experimental sections of an operating line are expected to furnish the following information:

- A comparison of RI levels for bundled conductor in delta and vertical circuit configuration with those of single 1.75-in. expanded ACSR in standard vertical circuit configuration.
- A comparison of flashover records on single-ground-wire lines with lines having two ground wires.
- A comparison of flashover records on delta-configuration towers with 20-ft-taller, vertical-configuration towers.
- Experience with the effects of ice and wind on bundled conductors and spacers.
- Data on vibration of bundled conductors and on the effects of spacers and various armor rods in reducing vibration.

AG&E Service Corp announced early in 1956 (AIEE 56-231) that part of this 345-kv line, to be constructed by Ohio Power Co, would have a new





Twin-Bundled Conductors at 345 Kv

tower design and bundled conductor. Construction started in 1956. This experimental portion (at top) has been built and energized for test while the balance of the line is being completed. Thus, the bundled-conductor section is now serving as a field test for comparison with data obtained in the laboratory and in calculations.

Bundled Conductor Might Be Needed in Future

Earlier studies showed that bundled conductor could not be justified economically for this line and that the only advantage in using twin conductors would be some possible improvement in RI levels. It was decided to use the 1.75-in. expanded conductor which has shown satisfactory RI characteristics elsewhere. However, the studies also showed that bundled conductor might be required from a capacity standpoint on future lines.

In addition to RI levels and behavior of twin conductors, it was decided to experiment with other changes to evaluate new theories regarding lightning flashover. Flashovers caused by lightning on the existing 345-kv lines were more frequent than originally estimated. Therefore, it was considered worthwhile to install two ground wires on this entire line for comparison with flashover records on other lines.

An additional experiment was the new tower design which lowers the top conductors about 20 ft, as compared with the conventional double-circuit tower. This was done by placing the two lower conductors of each circuit at the same level, forming a delta configuration with the three phases (left). For the initial installation both ground wires were strung, but only the conductors of one circuit.

Conductor for the test sections was purchased from Kaiser Aluminum & Chemical Corp, who suggested vibration tests to determine the effects of spacers. Elaborate equipment was installed in a trailer, and data are being collected on the damping effects of spacers and on vibration under various armor rods. In addition, accurate data are being gathered on stringing sags and tension for comparison with final sags and tension. This will also serve as a check on lab tests.

Canned Motor Pump Works Well

Applied for boiler circulation duty, it passes accelerated wear tests, although some design changes are made

J. R. SLACK, Superintendent, Possum Point Power Station, Virginia Electric & Power Co, Dumfries, Va.

Canned motor pumps are satisfactory for boiler circulation duty and have potentials for other power plant applications. These are the conclusions of Virginia Electric & Power Co following two years operation of its first canned motor pump. During that time the pump was subjected to accelerated wear and normal service, and several design changes were made.

The new-type pump was installed for a 100-Mw controlled-circulation boiler rated at 750,000 lb per hr, 1,450 psi, 1,000/1,000F. It was first used for pre-acid boil out, acid cleaning, and neutralizing boil, and then put in service in June, 1955.

To accelerate normal wear the pump was stopped and started every 24 hr for 31 days. It was placed on hot standby during four periods of 2 hr or less and once for 4 hr. These operations were equivalent to about two years wear.

After six months operation (4,500 hr) the pump was dismantled. Some deposit was found on the vanes and other impeller parts. The upper impeller wear ring was eroded, as was also the thermal barrier around its entire circumference. The lower radial bearing, a cased Graphitar sleeve, was in fragments except for a small section which apparently centered the rotor, as there was no unusual noise or excessive vibration.

The thrust bearing had some grooves, probably caused by contaminants in the cooling water. Both the upper radial bearing and journal appeared normal. But the lower radial journal was galled, and heat had discolored the lower section of the rotor can. The stator was in mint condition.

Damaged parts were replaced. Also replaced, as a matter of convenience, were the thrust runner nut, impeller nut, and upper and lower bearing housings.

Following the next 1,380 hr of operation another inspection was made. The deposit on the upper impeller wear ring was similar to that found in the original inspection, but the ring was not eroded, nor was the thermal barrier. Again the lower radial bearing was in fragments.

The thrust bearing showed wear due to the abrasive material in the water. The upper radial bearing had failed. Its Graphitar had cracked and separated, although the parts remained in the casings, apparently functioning normally. Both upper and lower journals were scored. Lower end of the rotor can had rubbed on the stator can but not severely enough to require replacement of either part.

Canless Rotor Installed

The same parts were replaced again, but some were improved designs. A new thermal barrier was stellited in areas eroded at the first inspection. The upper wear ring was modified to reduce velocity and, thus, prevent erosion. Clearances of both upper and lower seal rings were increased. An axially compressed bearing was used for the lower radial bearing, and its housing was shielded to prevent damage during hot standby service. Bearing clearances were increased.

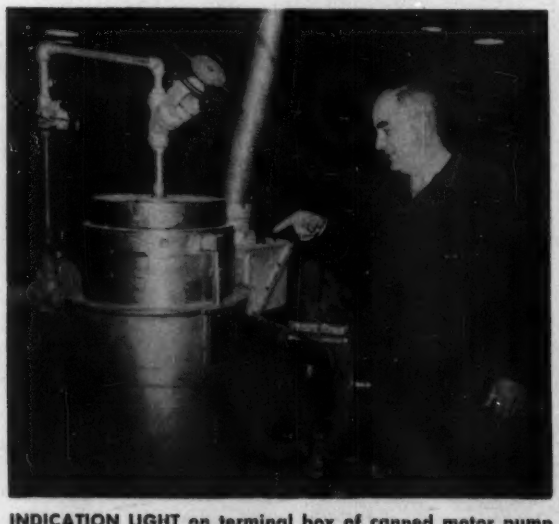
After 534 hr of operation the canned motor pump was again inspected. The pump was in new condition. As a precaution, a new axially restrained bearing was installed in the upper journal.

A fourth inspection was made after 6,300 hr more of operation. Again the pump was in excellent condition. Deposits were again found on the upper side of the impeller and on the thermal barrier. Before the pump was returned to service, a canless rotor was installed.

After 5,000 operating hours a fifth inspection revealed that the lower bearing Graphitar lining was cracked but in place. It appeared that the pump would have run indefinitely. Also found were deposits in the upper pump cavity and on the thermal barrier. Because such deposits have been found during all inspections, they are believed to be serious enough to warrant design changes to eliminate the trapping of various oxides in this area.

Based on 15,000 hr of operation Vepco believes that the pump is a good piece of equipment. Its use eliminates all external glands and associated expensive water-injection equipment, thus improving the station heat rate by about 15 Btu. Motor efficiency, however, is slightly lower.

Adapted from a paper presented at the Southeastern Electric Exchange Engineering & Operation Section meeting, Atlanta, Ga.



INDICATION LIGHT on terminal box of canned motor pump is surest means of knowing very quiet pump is operating. Pump's use eliminates expensive water-injection equipment

Residential Load Study Is a Key to the Future; Does Your Company Use It?

Virginia Electric & Power Used It to Find Out:

1. Will today's rates be adequate when applied to the large domestic loads expected to be more prevalent?

2. Should space heating be promoted actively? Is it profitable at existing rates; will it continue to grow in the Vepco area?

3. Is the present method of furnishing controlled water-heating service outmoded? If so, what should be done?

Vepco Got the Answers—and Put Them Into Action

T. D. FULFORD, Vice President, Virginia Electric & Power Co, Richmond, Va.

T. L. SHARKEY, Consultant, Ebasco Services, Inc, New York, N. Y.

Virginia Electric & Power Co is making effective use of a new management tool—residential load analysis. This significant key to the future can measure the dimensions of a distinct change now taking place in the residential load pattern. The change is a direct result of greater utilization of appliances.

At Vepco residential service is big business. It accounts for 45% of electric revenue, compared with a 34% average for major U. S. utilities. In addition, Vepco's residential customers have doubled their power use in the past 10 years.

The importance of residential load to Vepco led the company to join with Ebasco Services, Inc, in making a comprehensive economic and load analysis. Vepco was seeking answers to three main questions about (1) revenue adequacy, (2) space heating, and (3) water-heating service. The company got those answers and other important ones—and put them into productive use.

Vepco management accepted most recommendations resulting from the study. Only the highlights are reported here, but a great deal more data were developed as a basis for evaluating residential rates and for establishing a balanced load-building program.

And the survey didn't end there. Vepco is using the methods and procedures of the study as a framework for a continuing systematic program of load research.

The three major questions which Vepco wanted answered were:

1. Will existing rates provide the present adequacy of revenue when applied to the large domestic loads expected to be more prevalent?

2. Should space heating be promoted actively? Is it profitable at existing rates; will it continue to grow in the Vepco area?

3. Is the present method of furnishing time-controlled water-heating service outmoded? If so, what should be done?

Briefly, the answers were:

1. The present residential rate is adequate under existing economic conditions.

2. The heat pump and electric space heating should be promoted actively, along with a continuing program of employee education on the subject.

3. Time-controlled water heating should be continued. It is satisfactory for over 90% of the customers and the rate appears adequate. However, some measure of relief could be provided for the small group of customers now receiving

inadequate hot-water service.

The study also led to three other significant developments:

- The selective meter test plan, an innovation in single-phase meter testing. This scheme employs sampling techniques in selecting meter types for test to improve overall accuracy and reduce operating expenses (EW, July 15, p 72).
- A basis for determining the optimum size of transformers for serving varying numbers of customers according to appliance usage.

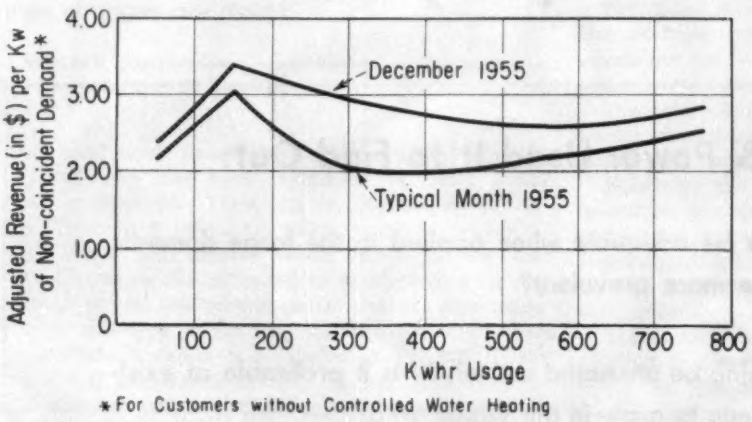


FIG 1—TREND OF CURVES shows present rates adequate for today's economic conditions. Earnings were measured in revenues per demand kw vs kwhr usage

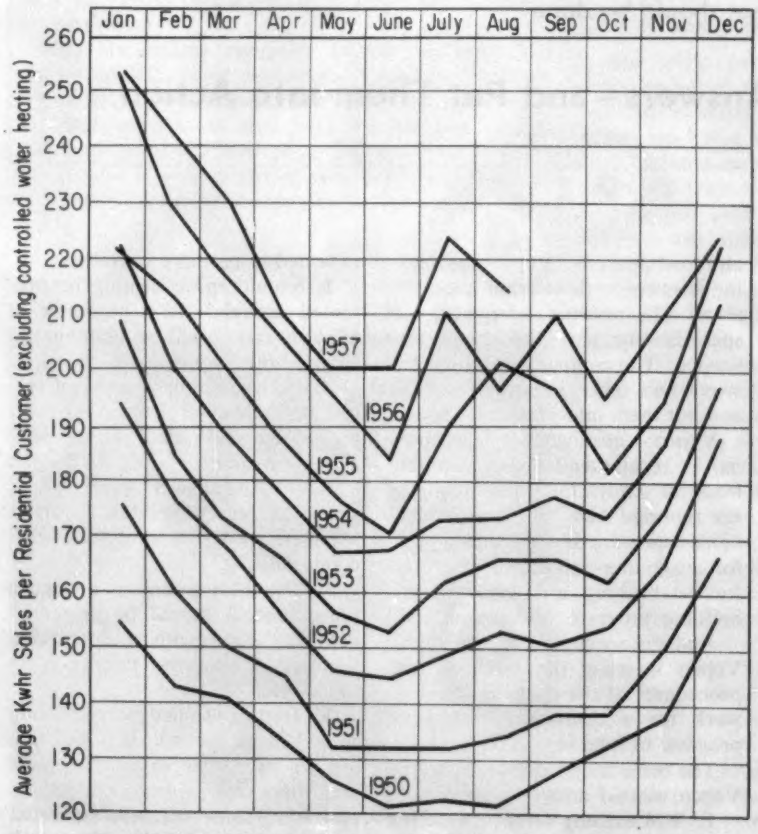


FIG 2—GROWTH OF COOLING LOAD was felt in past three years. But it is unlikely that summer residential load will exceed winter's for several years

- The basis of an estimate of appliance saturation for planning sales promotion. Previously, sales figures furnished by appliance distributors were relied on for these estimates, but their value was doubtful.

The survey comprised three broad areas of investigation:

1. Estimates of revenues per kw of maximum customer demand as a measure of adequacy of rates. These were developed by determining such load characteristics as load factor, coincidence factor, and maximum customer demand for the total class and for various combinations of major appliance usage.

2. Load analyses and estimates of the relative profitability of space heating. Growth in summer cooling, market potential and customer acceptance of electric heating, and practices of other utilities were studied.

3. A review of Vepco's time-controlled water-heating service. This phase considered the feasibility of uncontrolled service at a special rate for customers now finding controlled service unsatisfactory. Other methods of heater load control were studied and load analyses made of several forms of water heating.

Here is what the study revealed about each area of investigation.

1—Is Revenue Adequate?

In getting the answer—present rates are adequate for existing economic conditions—relative earnings were measured in terms of revenues per kw of customer demand vs monthly kwhr usage (Fig 1).

The important feature of Fig 1 is the trend of the curves. In low-usage areas the upward curves indicate that revenues from increased usage are more than sufficient to offset increasing demands. After reaching a peak the curves decline and tend to level off at the 500-kwhr area, where demands are around 5 kw. There the upward trend reappears and continues as load factor increases.

An analysis of a group taking controlled water heating and a group of space-heating users shows the same upward trend. A similar situation was also observed in each case where revenues per kw of demand were arranged according to five appliance usage groups.

The survey indicated a relatively

low saturation of residential air-conditioning equipment. However, some growth of summer cooling load was evidenced in 1955 and continued in 1956 and 1957 (Fig 2). This load is expected to increase rapidly as a result of the sharp upward trend in sales of window units and domestic central systems. But it is unlikely that the summer residential load will exceed the winter's for several years.

A measure of growth potential in residential service was also disclosed (Fig 3). Fifty-seven percent of the customers use only 28% of the total kwhr and have a single large appliance, a refrigerator. Annual load factor of this appliance group is next to the lowest of the five. Further analysis demonstrated that as the full-use customer becomes more dominant the annual load factor of the residential class will tend to increase.

Residential service is billed almost entirely on the basis of measured kwhr. However the investment required to serve the load relates primarily to maximum demands created. An analysis of relative earnings by kwhr usage in terms of revenue per kw of customer demand partially resolved differences which exist between the billing and investment units. Examination of the load characteristics of customers in the above average kwhr range is of particular importance in judging the adequacy of a rate in the future.

The ratios of revenues per kw for various kwhr groups become more comparable when customer costs, which remain constant regardless of usage, are eliminated. Revenues per kw in Fig 1 were adjusted by deducting the estimated monthly customer cost. This cost comprises fixed charges on the investment in service wires, metering equipment, maintenance of these items, billing, meter reading, sales promotion, and the associated portion of general property.

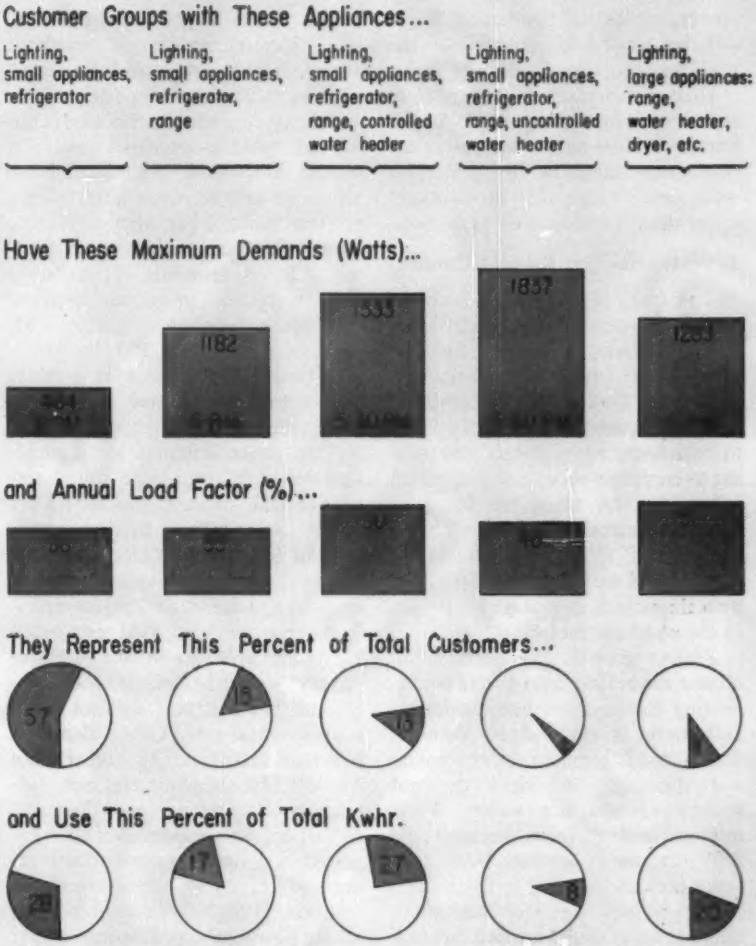

Customer Groups with These Appliances...
Lighting, small appliances, refrigerator
Lighting, small appliances, refrigerator, range
Lighting, small appliances, refrigerator, range, controlled water heater
Lighting, small appliances, refrigerator, range, uncontrolled water heater
Lighting, large appliances: range, water heater, dryer, etc.
Have These Maximum Demands (Watts)...
1182
1857
and Annual Load Factor (%)...
They Represent This Percent of Total Customers...
57
15
and Use This Percent of Total Kwhr.
17
37
8

FIG 3—APPLIANCE USAGE GROUPS have these characteristics. Demands and load factors are measured at individual customer meters. Total residential demand is maximum of 779 watts per customer at 6 PM; load factor is 46%

2—Promote Space Heating?

Vepco adopted the two major recommendations on space heating: (1) promotion of this form of heating to balance the trend to a summer system peak; and (2) a program of educating key company personnel and prospective users on space heating and the heat pump. These recommendations were based on several important conclusions:

- When cooling loads produce a system peak in the summer, winter generating and transmission capacity will more than carry probable additions in heating loads. Even before then, estimated new heating loads will not require increases in planned generating capacities.
- In spite of the relatively low load factor of electric heating, its diversity with air conditioning should improve the efficiency of power supply facilities.
- At the distribution system level, revenues from space heating are at least commensurate with costs of reinforcing capacity to serve the additional load.
- Electric space heating has won customer acceptance in the Vepco area. It is fairly competitive with other forms of heating if installed according to the company's specifications in a home which is adequately insulated.

Load analyses indicated considerable diversity between resistance space heating and total residential load (Fig 4). Space heating hits a peak at 8 AM and is 80% of its maximum at 6 PM, the time of total residential peak load. The average of individual annual load factors of space-heating customers is 16%, compared with 20% for heat-pump users.

Space-heating tests were conducted in an area near Norfolk. The loads of 29 homes heated by cable in the ceiling were measured for two weeks during the coldest part of the winter. All are one-story single-family dwellings of brick

veneer, typical of residences which will be heated electrically in the Virginia Electric & Power area.

Heat-pump tests, however, were conducted throughout the Vepco territory. Heat-pump customers are not concentrated in any particular area, and they are substantially fewer than space-heating customers.

3—Water-Heating Control Dated?

The study revealed that the company's time-controlled water-heating service was satisfactory for over 90% of the customers and the rate adequate. This service is furnished under a separate flat rate per kwhr to customers with heaters conforming to company specifications, which follow NEMA standards for two-element heaters. The present charging time of 15 hr (noon to 4 PM and 10 PM to 9 AM) is controlled by a time-clock device which is part of the watthour meter.

Recent growth has been in an almost unvarying ratio of one water-heating customer for two residential customers. It was evident, however, that a small segment of controlled water-heating customers do not receive enough hot water. Their number will increase because the difficulty stems mainly from too-small tanks.

Vepco may consider furnishing uncontrolled water-heating service on an optional basis by means of a monthly discount on charges in the residential schedule. The discount would vary according to tank size and would apply only if the heater met Vepco specifications.

Besides eliminating a watthour meter, this uncontrolled water-heating service would provide some relief to customers who find controlled service unsatisfactory. It would also reduce trouble calls and stimulate sale of water heaters.

And there is another favorable aspect of uncontrolled water heating. Group demands of this service usually peak in the late morning and again between 7 and 9 PM. Loads during 1 to 4 PM, the probable time of a summer system peak, are considerably lower than those of present time-controlled heaters.

Two other schemes for controlling water heating were found uneconomical or impractical. They were: Substituting carrier-current control for the time clock; and an optional rate for service controlled by a range-and-water-heater relay.

After a review of load tests made by other utilities on the high-recovery water heater, it was concluded that this unit did not merit a preferential rate. Group demands per tank, substantially higher than the NEMA heater, are not sufficiently offset by increased diversity. It will not be served under the suggested rate for uncontrolled service until additional load tests are made.

About 120,000 customers were taking time-controlled water heating when this study was undertaken. From the sample data it was estimated that another 29,000 had uncontrolled heaters. The residential sample provided enough customers of both types to produce stable results from load tests.

Demands of selected types and sizes of heaters were recorded for two weeks in April. Analysis indicated that demands of controlled heaters were considerable at 1 PM and highest at 11 PM. Uncontrolled heaters usually registered maximum demands in the late morning. Although somewhat lower than the demand of controlled heaters, the uncontrolled demand contributed substantially to the 6 PM winter system peak.

Under the present 15-hr charging period, controlled heaters make a sizeable contribution to the summer system peak, which occurs between 1 and 4 PM. When the summer peak is higher than the winter's in the same calendar year, the charging cycle will be changed completely.

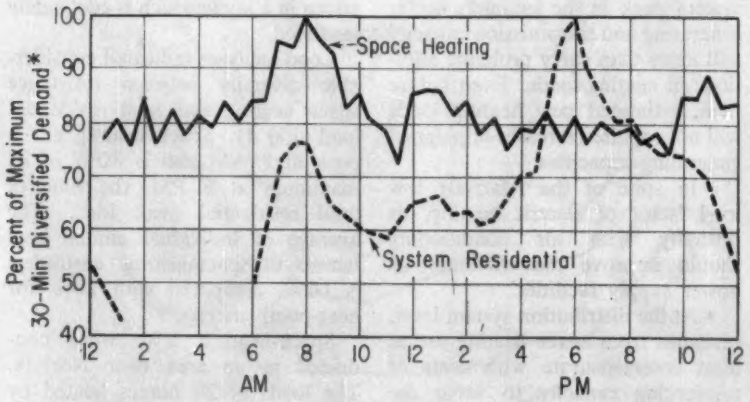
How Customers Were Selected

The number of available recording demand meters limited the sample to 500 of the 575,000 customers. To obtain maximum accuracy from such a small sample, the first step was to establish zones of monthly kwhr usage. The number of zones, the kwhr range within each, and the proportion of test meters in each were determined by two factors: the proportion of all residential customers and the anticipated demand variation in each zone.

Eleven kwhr zones were established. Standard statistical methods were employed to attain maximum sampling accuracy in allocating test meters to zones and company districts.

Demand readings of total customer loads were taken at 30-min intervals for two weeks in both summer and winter and transferred to IBM cards for analysis. A count of each customer's major appliances was the basis for estimating saturation, singly and in combinations of appliances.

Besides testing statistical stability of the sample, two practical tests were made of its representativeness. An estimate of average annual kwhr per customer was quite close to the actual. And the saturation of separately metered time-controlled water heaters estimated from the sample was almost the same as that determined from company records.



*Maximum system residential diversified demand: 0.779 kw per customer = 100%; Maximum space-heating diversified demand: 7.288 kw per customer = 100%

FIG 4—CONSIDERABLE DIVERSITY between resistance space heating and total residential load is indicated in this pattern of a typical Vepco weekday load

Unmasking a safe ground

Capacitors should be grounded to make them safe. Ask any lineman who has brushed against ungrounded equipment 25 feet up a pole—he'll tell you!

General Electric solves the problem of positively grounding 50-kvar capacitors by a simple step in finishing. The mounting hole area is masked during painting and the mask stripped off afterwards to leave clean, unpainted metal on the bottom of the bracket. The capacitor practically arounds itself as soon as it is mounted in a rack.

The ground is permanent, too. Corrosion won't foul the metal-to-metal contact.

Want to know more? Your G-E Apparatus Sales Engineer will welcome your capacitor questions. Or write to General Electric, Section 445-3, Schenectady 5, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Micarta Saves As Covering On AL Leads

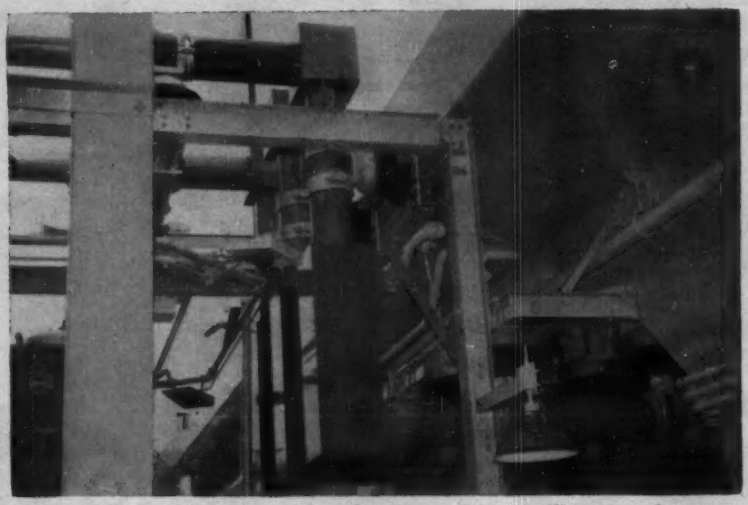
GENERATION—Design

SEYMOUR CAMBIAS JR, Engineering Dept, New Orleans Public Service Inc, New Orleans, La.

Generator leads of tubular aluminum covered with micarta, installed for a 115-Mw unit at Michoud Station of New Orleans Public Service Inc, saves an estimated $30,000 and eliminates condensation, tapping and maintenance problems.

The leads from the generator terminals to the main transformer, a distance of 66 ft, are 10-in. aluminum tube with a ½-in. wall. Between the generator and the auxiliary transformer, a distance of 34 ft, the aluminum is covered with micarta tubing, NEMA Grade XX. The remaining length is uncovered to facilitate tapping.

The micarta tubing is about 10 $\frac{1}{32}$ in. ID and has ¼-in. wall thickness. It was pushed over the conductor and joined with sleeves glued at only one end. At some locations sleeves were split and spread to fit over the micarta tubing.



GENERATOR LEADS are covered with micarta from auxiliary transformer to 115-Mw unit, but uncovered for tapping between auxiliary, unit transformers

The slits were positioned at the bottom of the tubing.

Micarta boxes, built around generator terminals and connectors, are supported on the leads which, in turn, are supported by bus clamps on porcelain insulators. Oversize clamps were required for the covered portion of the leads.

Use of micarta stems from its successful application elsewhere. It is believed that the covering prevents phase-to-phase faults across the 3-ft spacing where the consequences of a fault would be most severe or objects could fall on the leads.

The generator leads are rated 6,500 amp and 13.8 kv. The neutral is grounded through a high resistance to limit the magnitude of ground faults.

GENERATION—Maintenance

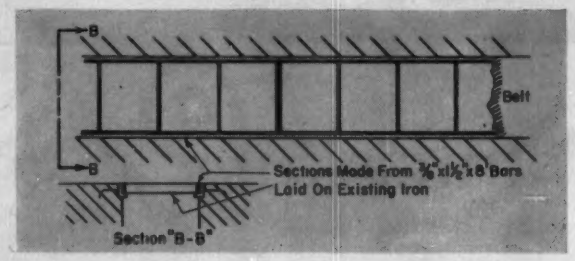
Bunker Grating Improved

V. C. FAY, Maintenance Foreman, Tanners Creek Plant, Indiana & Michigan Electric Co, Lawrenceburg, Ind.

Bunker grating at the Tanners Creek Plant has been improved to eliminate belt damage and overtime repair work.

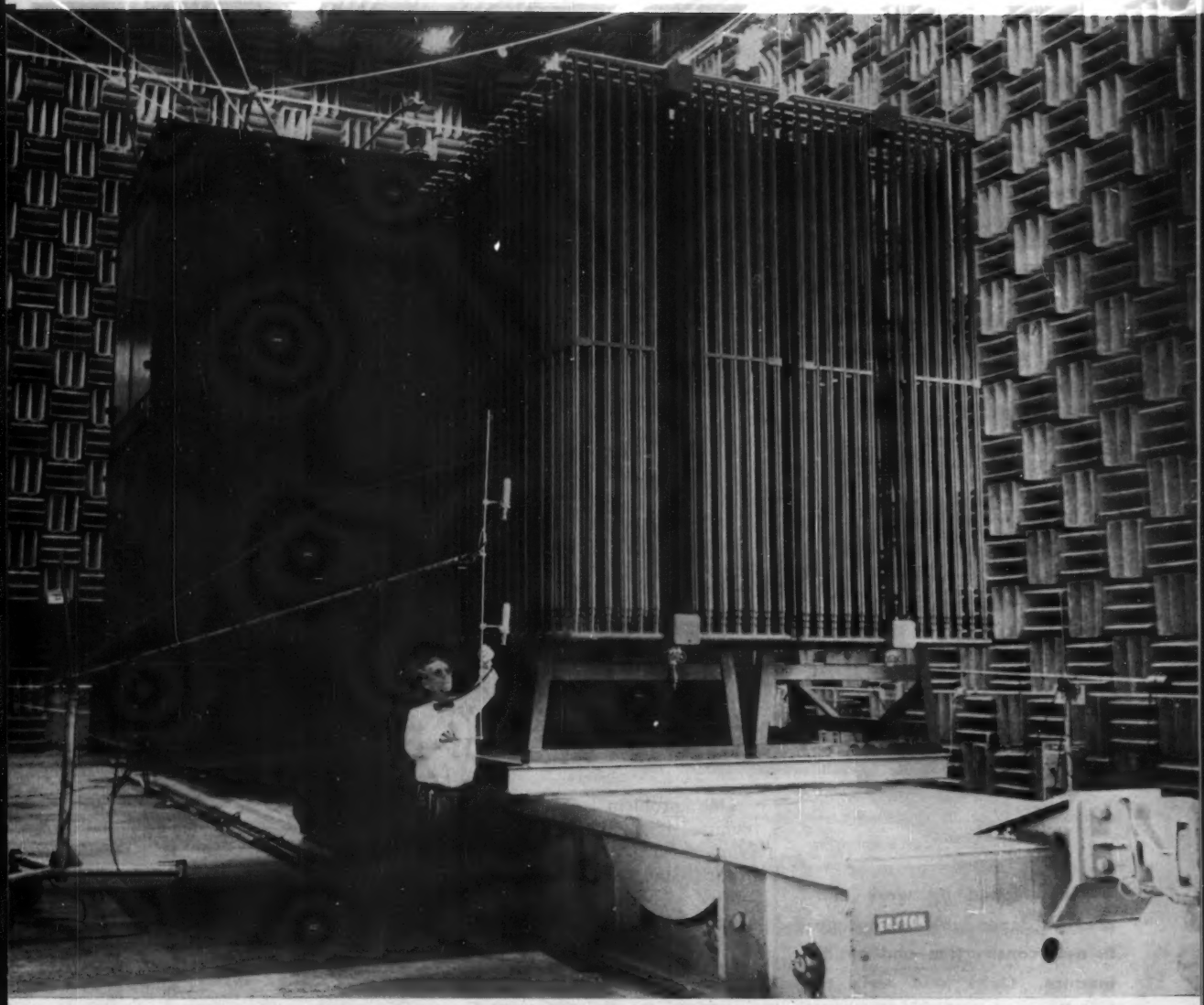
Damage to the original gratings between the coal bunkers and tripper car caused it to roll up and damage the seal belt as the tripper car passed over the bad section. Replacing this grating required overtime work, as the bunkers were full each day during the maintenance department's normal working hours. Repair required the use of cutting torches and welding for which special preparations had to be made to prevent sparks from falling into the coal bunkers.

The original gratings were replaced by removable sections of grating made in 8-ft lengths from ⅜ x 1½-in. rolled-steel bars. The sections were spaced 9 in. apart and bolted together at each end. Adjacent sections were also bolted together.



When this new grating is damaged, involvement of the seal belt is less likely, so that longer belt life is assured. Replacement of the section takes only minutes, spare sections being ready for installation. These are merely laid on existing iron without use of torches.

(*More How To on page* 86)



STEEL HOODS TRAP 15 TO 21 db

Here's a new method for combating transformer sound. General Electric's aphonic enclosures permit you to specify power transformers with 15- to 21-decibel reductions below NEMA levels. Costs are generally below those of other sound-reducing methods.

The enclosure, or hood, is fitted as an integral part of the main transformer to form a chamber which, combined with the use of noise-absorbing batts, effectively muffles sound. Flexible oil connections reduce noise transmission to the cooling equipment.

Additional benefits include:

- Sound is attenuated in all directions.
- Cooling efficiency is retained.
- Installation is simple because of factory assembly.
- Uprating a substation is not limited by permanent walls or barriers, since enclosure moves with transformer.

Power transformers with aphonic enclosures are available, with and without LTC and/or switchgear, in any size. Units rated 10, 25, 35, and 70 MVA are either completed or under construction. For details, contact your G-E Apparatus Sales Engineer. General Electric Co., Schenectady 5, N. Y. 421-51

Power Transformer NEWS

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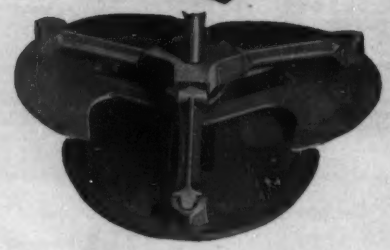

They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install—made of tough rust-resistant malleable iron—their holding power "tops" all other. Available two-way, three-way, four-way, and cone types. Write for facts.

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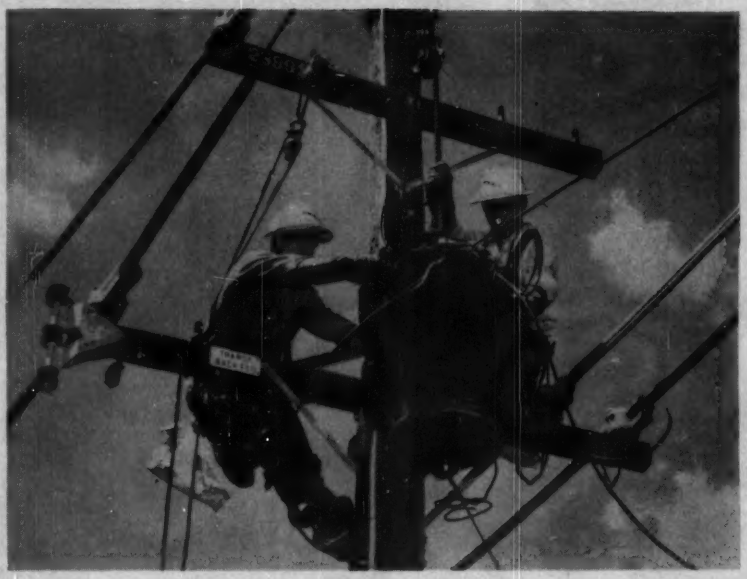
EVERSTICK ANCHOR CO
FAIRFIELD, IOWA



Sign Warns of Backfeed

One problem of banked secondaries is the backfeed to transformers when primary cutouts are opened for work on the transformer. This is particularly true where banking of secondaries is not system practice, so that some secondaries are banked and some aren't.

To warn linemen that a backfeed condition exists Commonwealth Edison Co attaches a sign. "Transf. Back Fed" on the crossarm. The sign is of 18-gage sheet steel and is porcelain enameled. It is 3¾ by 8 in. with red lettering on a white background. Lettering is on two lines with "Transf." on the top line and "Back Fed" on the second line.

There are four ¼-in. brass eyelets in the corners. The sign is fastened to the crossarm with ¾-in., No. 10 brass wood screws.

Portable Tester Checks Rubber Gloves in Field

F. W. JONES, System Safety Director, Gulf States Utilities Co, Beaumont, Texas

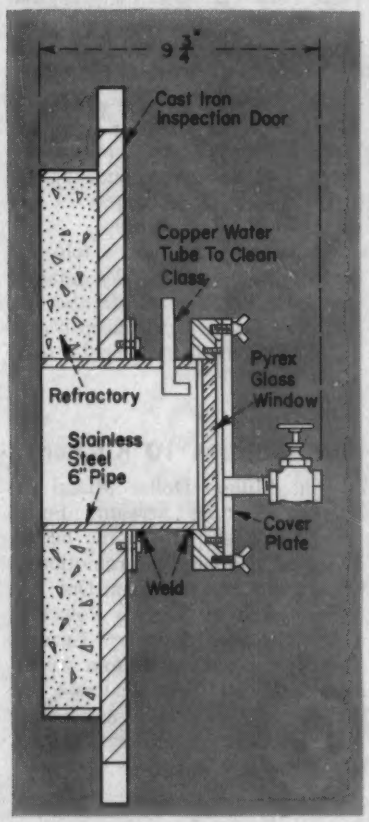
A portable rubber-glove tester is used by Gulf States Utilities Co to inflate gloves in the field where a supply of compressed air is not available. The tester quickly shows cuts, pin holes, and other damage.

Developed by the White Rubber Co at the request of the company, it consists of a hand pump with an adapter for securing the cuff.

Revised Hopper Doors Cut Labor

ORVAL F. GREEN, Maint. Foreman, Tanners Creek Plant, Indiana & Michigan Electric Co, Lawrenceburg, Va.

Observation of the interior of the ash hoppers during sluicing was greatly hindered by corrosion of the aspirating doors. They required continual maintainance to keep them clean and in working order.



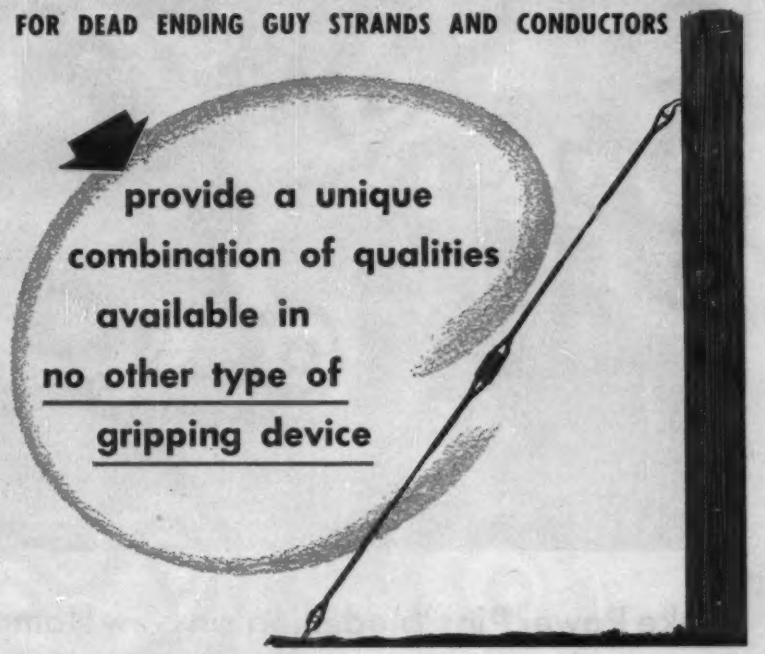
The doors were too small to give a good view of the hopper.

To obviate these difficulties, the large inspection doors on one end of each hopper were equipped with 6-in. dia Pyrex glass windows. These proved so satisfactory that all three units at Tanners Creek Plant have been similarly equipped. Operators now see ash accumulation and check the hopper after sluicing ashes.

Furthermore, the aspirating doors have been removed.

FANNER FANNGRIPS

FOR DEAD ENDING GUY STRANDS AND CONDUCTORS

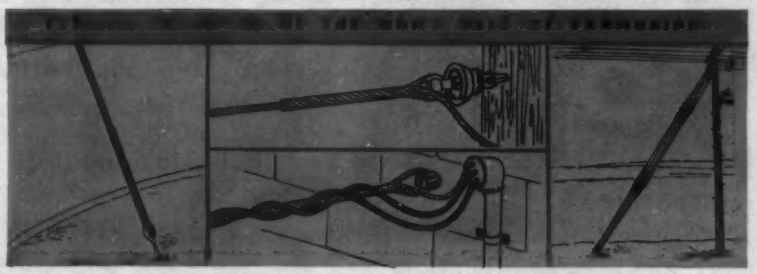


FANNGRIPS are made of highest grade spring-type wire by Fanner's exclusive roll-forming process. They provide a permanent and positive grip, and, because the frictional force is greater than the strand strength, FANNGRIPS cannot slip!

- Provide maximum load strengths — eliminate variables in application.
- Apply in a minimum of time — eliminate laborious field fabrication.
- Permanently tight, self-clamping — no movement or relaxation due to load reversal.
- Corrosion resisting.
- May be removed and reapplied when necessary.
- Do not damage surface of strands.
- Neat application without bulk — no dangerous or wasteful ends.
- Available in electro galvanized steel, copperweld or aluminum alloy.

No other dead-ending method matches FANNGRIPS economy!

WRITE FOR CATALOG



Licensed for use under patent Nos. 2,275,019 and 2,587,521

Fine Fanner Superformed

THE FANNER MANUFACTURING COMPANY

Electrical Products Division

BROOKSIDE PARK • *Established 1894* • CLEVELAND 9, OHIO

Telephone: SHadyside 1-6000

AGENTS and DISTRIBUTORS IN PRINCIPAL CITIES

ARMOR RODS • LINEGUARDS • TAP ARMOR
PATCH RODS • FANNGRIPS • PLASTIC FANNGUARDS
PLASTIC INSULATING TUBINGS AND MOLDINGS

Duke Power Pins 'Medallion' on New Home

The first Live Better Electrically "Medallion Home" in the country was opened recently in Hickory, N. C., by Duke Power Co. The home is a Gold Medallion Home—one that has year-round electric heating and air conditioning in addition to its appliance, wiring and lighting features (EW, Oct. 28, 1957, p47).

Neil Ervin of Twin City Builders, the outfit that built the home, is shown placing the medallion in the sidewalk at the front of it during opening day ceremonies. Watching him, l to r, are D. W. Jones and L. B. Hardesty, both of Duke Power, and Beemer Harral, architect who designed the home.

About 1,000 people inspected the Gold Medallion home the first day. Duke Power provided plenty of advanced publicity, and the event received wide area coverage in newspapers, radio and TV. The utility plans to put 10 of its residential reps to work with the area's 400 builders to push Gold Medallion Homes.

SoCalEd Kicks Off Dryer Campaign

An intensive sales and advertising campaign for electric dryers has been kicked off by Southern California Edison Co. A total of 2000 appliance dealers attended a three-week series of sales meetings last month. The campaign will run from mid-October through February.

One main objective of the campaign, says SCE general sales manager Harold L. Moore, "is to explode once and for all the myth that nothing dries like the sun." Edison's advertising target: 70 million impressions a month. The pitch: "Only Electricity Dries Clothes Fresh-Air Sweet Indoors."

Edison hopes to spur dealers' promotion and merchandising efforts with a sales contest. Forty dealers will win vacations.

Clothes dryers, Moore told the dealers, have won a 12% market saturation in 10 years. In the first half of 1957, he said, electric dryers out sold the flame type 2.4 to 1.

Fair Features 10 Kitchens

"The Million Dollar Miami Influential Electric Servants Fair," termed by its sponsors the largest coordinated appliance promotion in history, was run in Miami Dec 1-8.

Sponsored by Florida Power & Light Co and Saturday Evening Post, it was backed by four weeks' promotion by local dealers. The 42,000 sq ft of display and selling area included 10 full-line kitchens.

Hotpoint-Swift Cookery Road Show Rolls Up Sales

With a trail of utility acclaim and appliance sales behind it, the Hotpoint-Swift roadshow, Professional Cookery Profit Clinic, is rolling on to further performances with advance bookings for well into 1958.

Designed for utility sponsorship with local dealer participation, the show played to 2500 members of the food service industry in 11 Ohio cities on its tour of Ohio Power, Ohio Edison, and Toledo Edison.

"It proved of considerable benefit in consolidating our customer relations," reports Indiana & Michigan Electric Co's J. C. Zeiler. Other utilities that sponsored the show were also enthusiastic. So were appliance dealers, who reported increased broiler sales after customers watched the 90-minute show.

Hotpoint and Swift are happy, too. Hotpoint reports broiler sales doubled, and Swift says its frozen portion-cut meat business has tripled.

The show's initials keynote its theme. It's all about meat—purchase control, portion control, preparation control, price control, and profit control. Hotpoint presents the latest electrical cooking techniques, and Swift describes its new line of precision-cut frozen meats.

(*More Selling on page* 90)

Square D announces...

NEW SPIN TOP ENCLOSURE FOR HAZARDOUS LOCATIONS

REAL PROTECTION against rain, dust, dirt and weather because male threads on collar section engage female threads on tank.

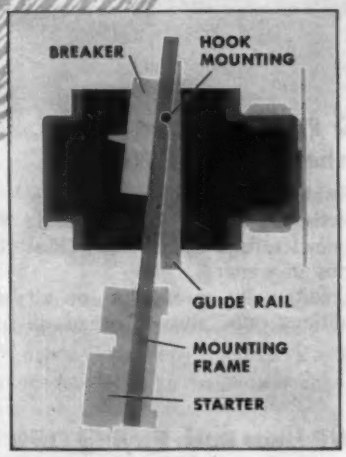
DAMAGE-RESISTING Acme thread. If you've struggled with "banged-up" threads, you'll appreciate this feature. It's always a breeze to put on and take off tanks for installation, inspection or maintenance.

INCREASED WIRING SPACE and through-feed conduit entrances for horizontal tap-offs.

EASY TO ADD pushbuttons or selector switches with easy-to-buy, easy-to-use "off-the-shelf" parts kits.

EASY TO INSTALL • "Slide and Hook" mounting arrangement takes the hard work out of the installation job. Diagram below shows how.

STRONG and LIGHTWEIGHT The complete enclosure is cast aluminum.



SLIDE and HOOK MOUNTING

4 SIZES FOR STARTERS SIZE 0 THROUGH 5

CLASS I, GROUP C and D • CLASS II, GROUP E, F, and G

The new **SPIN TOP** enclosure is available from your Square D Distributor in three ways—complete device, enclosure only, or components only...for reversing and non-reversing across-the-line starters and combination starters. And for combination and non-combination two-speed starters.

Write **FOR BULLETIN 9990**

Square D Company, 4041 North Richards St., Milwaukee 12, Wis.

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY

Heating Earns Rebate at AP&L

Utility pays employees cash to install heat pumps and/or resistance heating. Idea is to get them behind program

It literally pays to heat your home with electricity in Little Rock. It does, anyway, if you are an employee of Arkansas Power & Light Co, and you come under its new employee-incentive program for electric heat. Under this plan, you get paid for installing electric heat.

All this is part of AP&L's heat promotion program, kicked off last July with an announcement of a special rate (EW, July 29, 1957, p 73) for heating kwhrs. At that time the company dropped its rate from 1.9¢ to 1.2¢. The program is gaining. Quote AP&L president R. E. Ritchie: "Since the announcement of this rate we've had literally hundreds of inquiries from customers who are considering installing electric heating equipment in their homes. Scores of new electric heating jobs are going in now."

Regarding the employee reimbursement plan, Ritchie had this to say: "The plan we have developed for employees is a natural progression in our campaign to expand the use of electric house heating in our service area. For we know that each employee must be sold on this campaign if it is to go forward."

Here's how it works—

1. Any employee who installs an electric heat pump of a minimum 2-ton capacity for complete air conditioning of his home will receive a direct cash payment of $125.

2. Any employee who installs resistance heating will receive a payment of $10 per kw, provided the whole house is heated electrically.

There are no hitches. However, the utility does protect itself in the sense that it insures every job that goes in under this plan will be a good one. It stipulates that payment will be made only when the installation of electric heating is done according to company standards and can pass its standard inspection.

F-Q Pulls Seasonal Switch, Pushes A.C.'s in Winter

Fedders Quigan Corp is pulling a "seasonal switch" by promoting its new reverse-cycle room heat pumps in winter.

Traditionally, promotion of air conditions has always began in Spring. The F-Q unit, which both heats and cools, will try to capitalize on its heating cycle by beginning advertising and promotion in December. Promotion theme: "Extra months of comfort for the price of summer air conditioning alone." Campaign will run through June 15, followed by local-level emphasis.

WWP Heat Rush Paying Off

Washington Water Power Co's electric heating campaign, "Hotter Than Blue Blazes," (EW, May 20, 1957, p 120), is paying off handsomely in new customers. WWP reports installations up 1,300 since Jan. 1. Total jobs: 8300.

Of the 1,300 new customers, the breakdown, application-wise, is: 1,000 residential; 300 commercial and industrial. WWP says its percent gain in electric heating customers is among the highest.

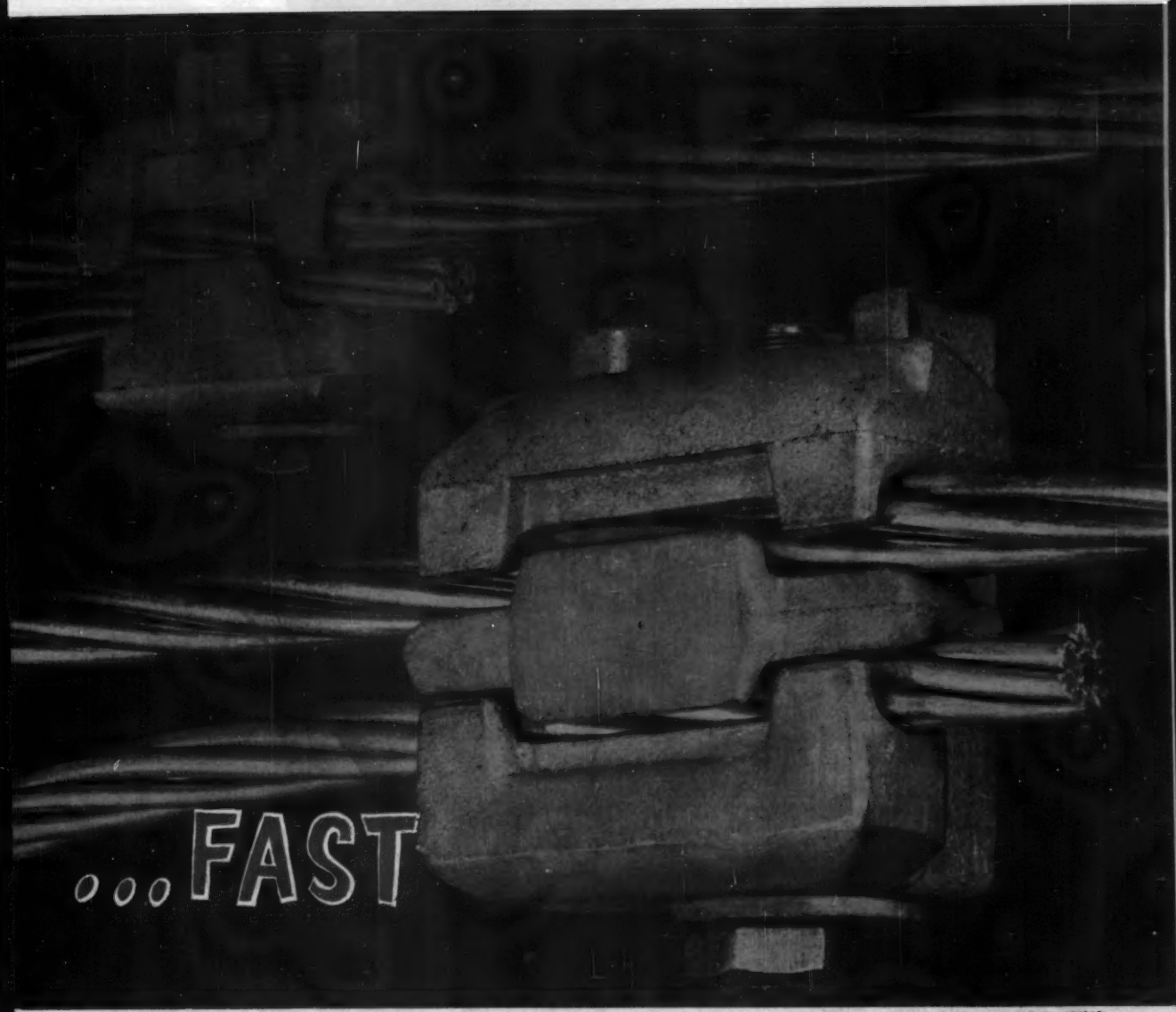
An added spur comes in the form of promotions by Inland Empire Electrical League. Its member dealers and contractors have been pushing electric heat for two months.

(*More Selling on page* 94)

DGD Bolted Dead-End Clamp

The DGD Bolted Distribution Dead-End is specially designed for light duty pole and house service drops. Eleven inch bale is compressed into the body of the clamp which includes a "wave seat" to provide added holding power. One piece clamp design assures quick, easy installation. Cable sizes from #8–1/0ACSR.

ANDERSON ELECTRIC CORPORATION
Birmingham 1, Alabama
Export Representative: International Standard Electric Corp.



DGA SERIES: SEVEN SIZES: #8 SOLID — 397.5 MCM ACSR (18/1)

One Piece Construction: Makes for fast installation. Just hook on the Main, insert Tap and tighten!

High Conductivity Spacer: Anderson's soft, pure, aluminum Cover-All Spacer assures additional contact with individual strands. Spacer design material and massive construction combine to provide cool running, long-life contacts.

Extended Spacer for Easy Application: Whether applying the DGA on "hot" or "dead," the Spacer can easily be picked up for Tap insertion.

Positive Interlocked Upper and Lower Grooves: Main and Tap groove alignment is maintained by interlocked casting bodies, thus aiding installation and improving contact efficiency.

Pre-Inhibited: All DGA connectors with spacers are chemically cleaned and inhibited at the factory. Contact resistance is greatly reduced and maintained by Anderson's exclusive inhibitor coating process. Gives corrosion protection without surface greasiness or tackiness.

Kleen-Seel: At slightly additional cost all DGA connectors will be delivered with grooves inhibitor-packed and the connectors sealed in polyethylene bags.

ANDERSON ELECTRIC CORPORATION
Birmingham 1, Alabama

Export Representative: International Standard Electric Corp.

ANDERSON ELECTRIC

Research / Quality / Performance / in Aluminum and Bronze Products

Aluminum and Bronze Power Connectors • Clamps • Fittings • Accessories for SUBSTATION • TRANSMISSION • DISTRIBUTION

FOR VOLTAGES UP TO 600...

There's a *Safe and Dependable* BUSS Fuse or FUSETRON Fuse to fit the needs of every user

If you want Plug Fuses . . .

Use BUSS Clear Window Plug Fuses

Their one-piece body and "safety" design guarantees protection.

They are most convenient to use too, because real big windows and white backgrounds permits entire fuse strip to be seen. Even in poor light a blown BUSS fuse is easy to find.

If you want to make safe protection REMAIN SAFE as well as REDUCE blowing fuses . . .

Use BUSS Fustats (have Type S base)

FUSTATS like Fusetron Fuses have a dual-element and therefore, stop needless blowing — and they do more.

They have a type S base that prevents anyone from replacing them with a penny or substitute — or using a size too large to protect.

FUSTATS fit standard plug fuse holders by means of an inexpensive adapter that locks in place and needs never to be replaced.

If you want to reduce blowing of Plug Fuses . . .

Use FUSETRON dual-element Plug Fuses

FUSETRON Plug fuses protect like ordinary fuses against short-circuits and overloads — but unlike ordinary fuses they won't blow on motor starting currents or other harmless overloads.

They are the type of fuses recommended in the 1953 National Electrical Code.

To protect motors and apparatus of voltages up to 125 against burnout . . .

Use 0 to 14 amperes BUSS Fustats

A FUSTAT of the proper size installed to handle only the motor current will reduce to a minimum the chance of a motor burnout from an excessive over-current. In like manner it will protect solenoids, coils and transformers against burnout.

FUSTATS have the same degree of Underwriters' approval for both motor-running and short-circuit protection as the most expensive devices made. They give all the protection it is possible to obtain with any device on the market.

FUSES! . . . THE SAFEST AND MOST DEPENDABLE PROTECTION YET DEVISED!

A fuse has just one vital part — a thin narrow strip of fuse metal. When the heat of a short-circuit is applied, the fuse link must melt and open the circuit.

The high speed operation of the fuse reduces to a minimum the danger of short-circuit damage to wiring and equipment.

Fuses offer dependable protection over the years.

The fuse link is sealed in. Dust can't get at it. Corrosion or oxidation can't increase its capacity or lengthen its blowing time.

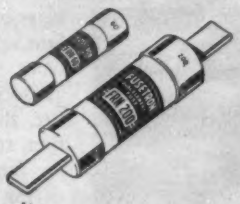
There are no hinges, pivots or contacts to stick or get out of order.

Millions of fuses have been in operation 30 years or more, because there has been no trouble on the

Play Safe! Install BUSS Fuses or

If you want fuses that — abolish all needless blows, stop overheating in panels and switches, protect motors against burnouts . . .

Use FUSETRON dual-element Fuses



With rare exceptions, ordinary fuses or circuit breakers do not protect except against short-circuit but FUSETRON fuses provide TEN POINT protection.

1. Protect against short-circuits.
2. Protect against needless blows caused by harmless overloads.
3. Protect against needless blows caused by excessive heating — lesser resistance results in much cooler operation.
4. Provide thermal protection — for panels and switches against damage from heating due to poor contact.
5. Protect motors against burnout from overloading.
6. Protect motors against burnout due to single phasing.
7. Give DOUBLE burnout protection to large motors — without extra cost.
8. Make protection of small motors simple and inexpensive.
9. Protect against waste of space and money — permit use of proper size switches and panels.
10. Protect coils, transformers and solenoids against burnout.

FUSETRON duel-element FUSES save you time and money because they are made to PROTECT — not to blow.

If you want Renewable Fuses . . .

Use BUSS Super-Lag Renewable Fuses

The big advantage of these fuses over all other renewable fuses comes from the prevention of useless interruptions of service caused by needless blows.

The reason for this performance is found in the design of the fuse-case which assures good contact on the fuse link, even if the fuse is renewed by an inexperienced person -- and by the time-lag built into the link that prevents the fuse from opening on motor starting currents or other harmless overloads.

If you want SAFE protection on loads above 600 and up to 5000 amps . . .

Use BUSS Hi-Cap Fuses

On voltages up to 600, high speed operation on heavy shorts limits current to safe values. This minimizes damage to equipment and cuts down dangerous stresses on transformers.

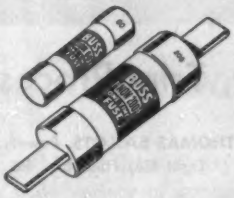
For Short-Circuit Protection or when fast opening is desired . . .

Use BUSS Limitron Fuses

The extremely fast opening characteristics of these fuses prevent heavy short-circuit currents from building up under fault conditions.

If you want Non-Renewable Fuses . . .

Use BUSS One-Time Fuses



They save you time and trouble because they get the same engineering care in manufacture as do all products carrying the BUSS Trademark.

Every BUSS One-Time fuse can be depended upon to operate as intended under all service conditions.

For protection of TV, Radio, Instruments, Radar, Avionics and Electronic Equipment . . .

Use BUSS and FUSETRON Small Dimension Fuses

A complete line is available. Made in Dual-element (slow-blowing), Renewable and One-Time types in sizes from 1/500 ampere up.

And there is a companion line of BUSS Fuse Clips, Fuse Blocks and Fuse Holders to take them.

circuits they are protecting and therefore no occasion to open.

Yet, after years of inactivity, you can be sure the fuse will give the same safe, dependable protection if called upon to open as it would have on the day it was installed.

NO RECALIBRATION COSTS

When Fusetron fuses do blow, there is no recalibration needed. As quickly as the fault in the circuit is corrected, you slip in a new fuse that has been CALIBRATED AT THE FACTORY BY ENGINEERS — a fuse that is as safe and dependable as the one that blew.

FOR MORE INFORMATION ON BUSS AND FUSETRON FUSES WRITE TO BUSSMANN MFG. DIVISION McGRAW-EDISON CO. ST. LOUIS 7, MO.

FUSETRON

TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION

BUSS

1257

Fusetron Fuses Now! THROUGHOUT THE ENTIRE ELECTRICAL SYSTEM

Electric Oven Cuts Glass Drying Time by 90%

EIGHT-KW OVEN dries 66,000 microscope slides in as little as 7 hours. Improved drying permits easier handling, reduces chance of chipping or breaking

T. W. SCULLY, Sales Applications Dept., Philadelphia Electric Co, Philadelphia

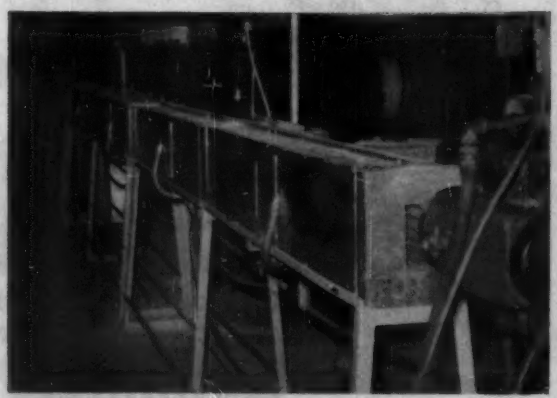
An electrically heated oven installed to dry glass microscope slides has paid off in increased production, a better quality drying and a reduction in storage space at C. A. Hausser & Son, Philadelphia medical equipment manufacturer. Heated by eight 1,000-watt strip heaters, the 7.5x7.5x2.5-ft oven can accommodate 66,000 1x3-inch slides. A blower assures proper circulation of hot air.

Cutting drying time by 90%, the new oven has enabled Hausser & Son to increase monthly production from 13,000 to 17,000 gross. Because of the improved quality drying, the slides are in prime condition, ready for inspection when they are removed from the oven. Proper drying permits easier handling and the risk of breakage or chipping is lessened.

Previously, slides were air dried, a time-consuming process that required 72 hours. The oven dries the slides completely in as little as seven hours.

Another unusual feature of the plant is a remote control wiring system installed for the office lighting. This permits fingertip operation of the lights from convenient locations in either of the two offices. The system uses low voltage and solenoid switches. Lighter gauge wire can be used from switch to fixture; installation is simplified. The offices also have electric space-heating, consisting of recessed baseboard heaters, which supply all their heating needs. Other electrical equipment in the plant includes ventilation, grinding and bevelling wheels, high temperature ovens for glass fusing, and miscellaneous shop machinery for fabrication.

Heat Ducts Boost Cable Quality, Trim Process Time



LEAVING EXTRUDER (right), cable passes through four 6-kw heat ducts. Capstan on other end spools finished product

THOMAS BALLOTS, Power Sales Engineer, Pennsylvania Power & Light Co, Hazleton, Pa.

A switch to electric heat for setting silicone rubber cable covering has improved product quality and stepped up production at the Electric Auto-Lite Co, Hazleton, Pa. Set up in a continuous row, four 6-kw heat ducts set the coating as the cable comes from the extruding operation. The baking is necessary to prevent insulation distortion caused by the plasticity of the raw compound. With the new electric equipment, the setting is now done as a continuous process.

Before the heaters were installed, the coated cable had to be spooled in single layers, each of which was individually baked in a cylindrical steam oven. This method was not only costly and time-consuming, but frequently produced a non-uniform insulation diameter.

electrical wonder rubber OFFERS TRIPLE VALUE

Performance! Versatility! Economy! In all three, Enjay Butyl is the world's outstanding rubber value. In a wide variety of applications, Enjay Butyl rubber stands *unmatched* in its ability to resist ozone and corona, impact and abrasion, moisture and weathering . . . properties that contribute to the *outstanding* performance of Butyl-made products.

Instrument transformers, underground service cables, high voltage industrial cables . . . in these, and many other electrical applications, Enjay Butyl out-performs and out-lasts *all other* types of rubber, synthetic *or* natural. *Low-in-cost* and *immediately available*, this truly wonder rubber may well be able to cut costs and improve performance in *your* products. For further information, and for expert technical assistance, contact the Enjay Company.

ENJAY BUTYL

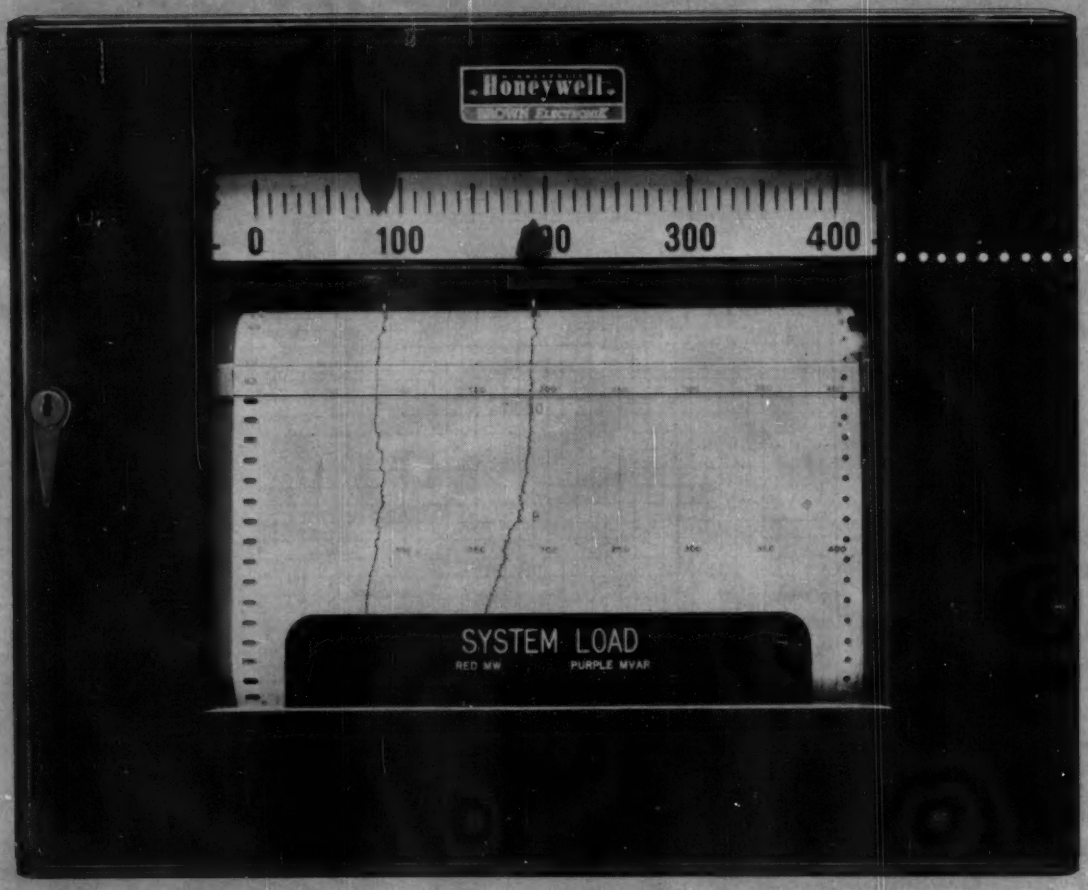
Enjay Butyl is the greatest rubber value in the world . . . the super-durable rubber with *outstanding* resistance to aging • abrasion • tear • chipping • cracking • ozone and corona • chemicals • gases • heat • cold • sunlight • moisture.

ENJAY

Pioneer in Petrochemicals

ENJAY COMPANY, INC., 15 West 51st Street, New York 19, N. Y.

Akron • Boston • Chicago • Detroit • Los Angeles • New Orleans • Tulsa

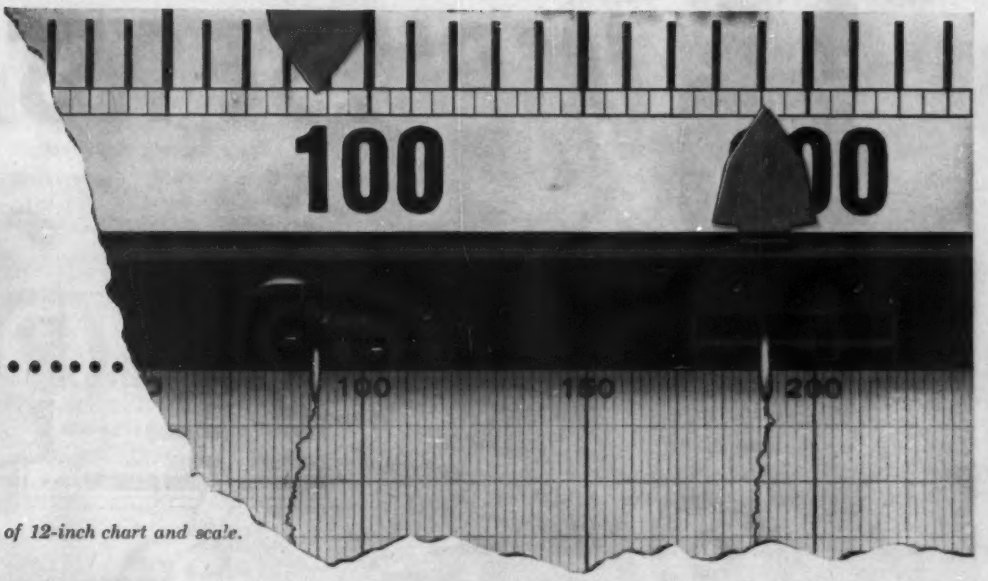


choose from three different ways to record load data:

1 both variables on a single chart and scale calibration; recorded in inks coded to match dual pointers (for the two-pen model illustrated above).

2 both variables recorded on the same chart, with dual scale calibrations that read watts and vars in the most convenient range for each.

3 variables indicated and recorded on a split chart and scale . . . ideal for combining four records of watts and vars that would overlap if all appeared on the same chart.



Actual size section of 12-inch chart and scale.

Watts and Vars at a glance ...on ONE instrument

The accurate, time-saving way to check watts and vars is to see them on the same *ElectroniK* instrument. One instrument does the job of two . . . needs only half the panel space, half the chart paper.

You can have watts and vars recorded in the way most convenient for your particular needs. Both values can be indicated and recorded *continuously*, by a two-pen model. Or, a single-pointer instrument can *alternately* print watts and vars.

Either way, you're sure to profit by the accuracy, dependability, and serviceability for which *ElectroniK* instruments are famous, in power plants and industrial installations everywhere. Ask your local Honeywell sales engineer to talk over your specific application . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

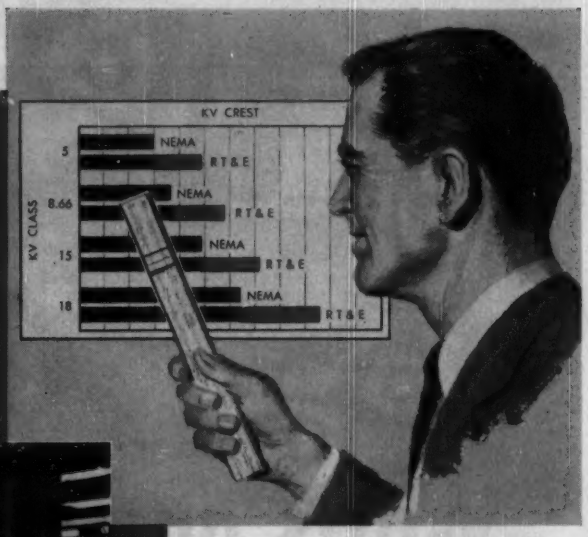
● REFERENCE DATA: Write for Bulletin 9070, "Instruments for Electrical Power Generation."

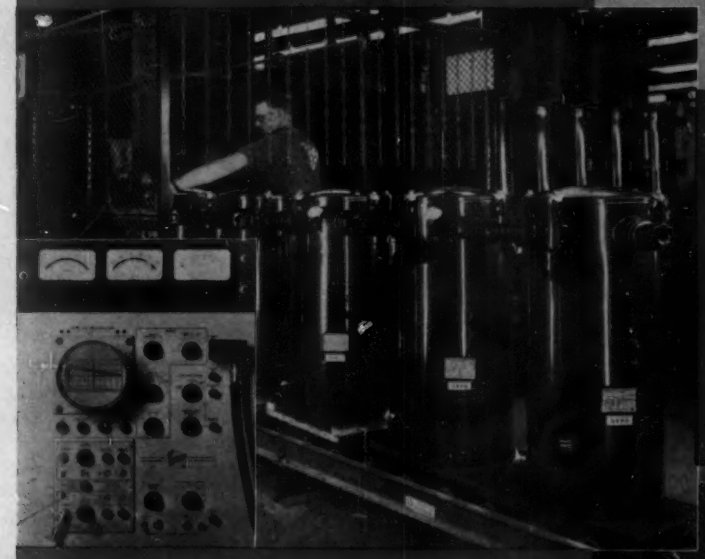
MINNEAPOLIS Honeywell
BROWN INSTRUMENTS
First in Controls

IMPULSE TESTED

DESIGN

High impulse strength in transformers is not attained by accident; it must be considered from the very beginning of design. Such is the case at R T & E, where transformer design is based on impulse withstand levels approximately 50% in excess of NEMA standards.





TESTING

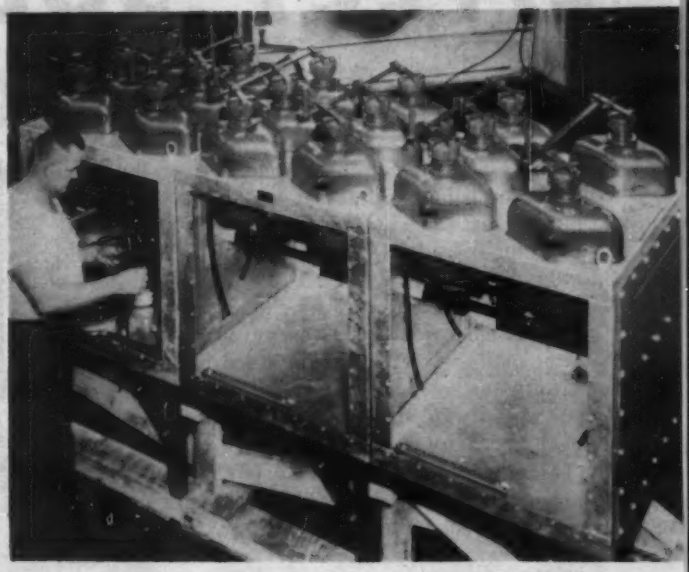
Every R T & E Transformer receives an "on the line impulse test" through use of the most modern equipment and methods known. This test not only insures that the transformer meets NEMA impulse level requirements but also rejects those transformers that are not of maximum quality.

OPERATION

Naturally, the ultimate in testing is provided "on the system", where nature subjects the transformer to the most rigorous tests. R T & E Transformers have been thoroughly proven in operation in every climate of the U. S. They have been awarded the invisible seal of customer satisfaction, proved by a growing list of customers who specify R T & E.

R T & E CORPORATION
WAUKESHA, WISCONSIN
Helping provide power for America

Oil Cutout Assembly . . .



. . . provides switching and protection for heavy industrial branch circuits. Metal-enclosed assemblies are installed in parallel at plant's feeder line switch, with one sectional assembly for each two branch circuits. Cutouts, single-phase or gang-operated 3-phase, are mounted on top of the box. Completely enclosed within the box are feeder bus runs, connections, and an electric heater element to dispel moisture.

First section also contains lightning arresters and a capacitor to help protect rotating machinery from transient overvoltages.

Boxes fit together so the whole assembly can be tailored to number and type of circuits needed. Bolting on more boxes handles expansion requirements.

First assembly made has six sets of cutouts rated 200 amp, 5.2 kv.

General Electric Co, Schenectady 5, N. Y.

Fittings . . .

. . . for welding aluminum bus connections in substation applications have smooth, rounded surfaces. Accurate cutting and fitting of bus is unnecessary, since "Duraweld" fittings serve as "welding jigs" for proper alignment and construction. The connection is durable. After a continuous bead weld has been run around the connection, the fitting becomes an integral part of the bus.

Anderson Electric Corp, Birmingham 1, Ala.

Precoated Connectors . . .

. . . are individually packaged in plastic. Bolted connectors and tap clamps of many sizes and types have their contact surfaces precoated with "z.l.n. 100" electrical contact aid. This saves installation time, since contact aid need not be applied on-the-job.

Lineman can remove a connector or clamp from its transparent-plastic protective covering without taking off his gloves. When twisted end of covering is snipped with side cutters, the connector can be slipped free.

Tapes on the covering remind the lineman to clean and apply contact aid to the conductors when making connection.

A. B. Chance Co, Centralia, Mo.

(*more New Equipment on page* 102)

EFFECT SUBSTANTIAL
USE G&W HI-LO

Looping an existing circuit through a new step-down substation being built created a problem for the Philadelphia Electric Company. The existing single conductor 69kv low pressure oil filled cables could have been cut and extended to the new substation with cables of the same type and by using commercially available joints for the purpose. However, a thorough study of the plan revealed that the use of high pressure oil filled pipe type cables for the new lines would result in substantial savings. The problem: no proven stop joint was available.

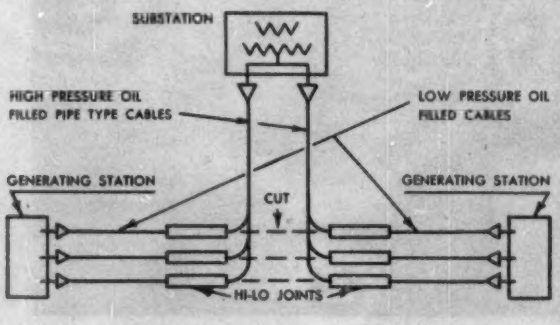
The solution was found in G&W's long experience and complete facilities for designing and manufacturing high voltage cable devices. A successful stop joint to connect 69kv low pressure oil filled cable with high pressure oil filled pipe type cable was produced by G&W collaborating with Philadelphia Electric Company and Phelps Dodge Copper Products Corporation.

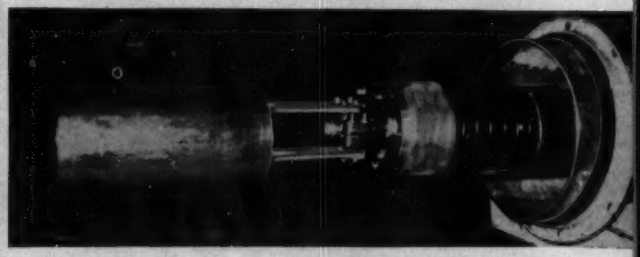
A few months after Philadelphia Electric's installation was completed a large western utility also learned that the HI-LO joint would be profitable to use in its system changes. Installation will be made early in 1958. A HI-LO joint may help reduce the cost of plans you are contemplating for the future. Review them completely. Our cooperation is assured.

TEST DATA—All mechanical and electrical tests proved satisfactory. No evidence of distress, such as carbonization or tracking, was found upon visual inspection and dissection of the joints. Electrical tests in accordance with A.I.E.E. No. 48—Standards for Potheads and High Voltage Time Test of A.E.I.C. Specifications for Pipe Type Cable were as follows:

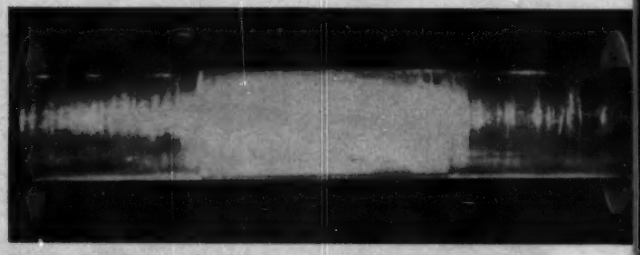
Impulse voltage withstand (350kv required)—OK
60 cycle, one minute withstand (175kv required)—OK
60 cycle, long time tests (97kv required for 6 hours)—OK

a) Withstood 123kv for 6 hours
b) Withstood 148kv for 6 hours
c) Withstood 172kv for 26 minutes—pipe type cable failed outside of joint

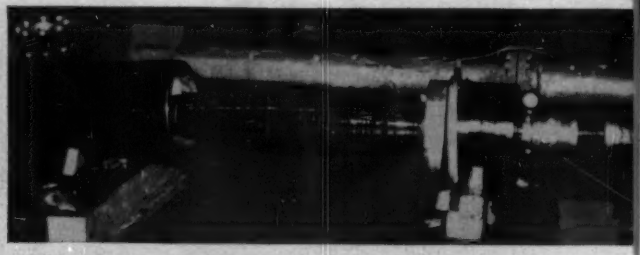




Terminal connectors of the opposing pothead ends are joined by copper straps. This central section is enclosed with a copper sleeve shield which constitutes the high voltage electrode.

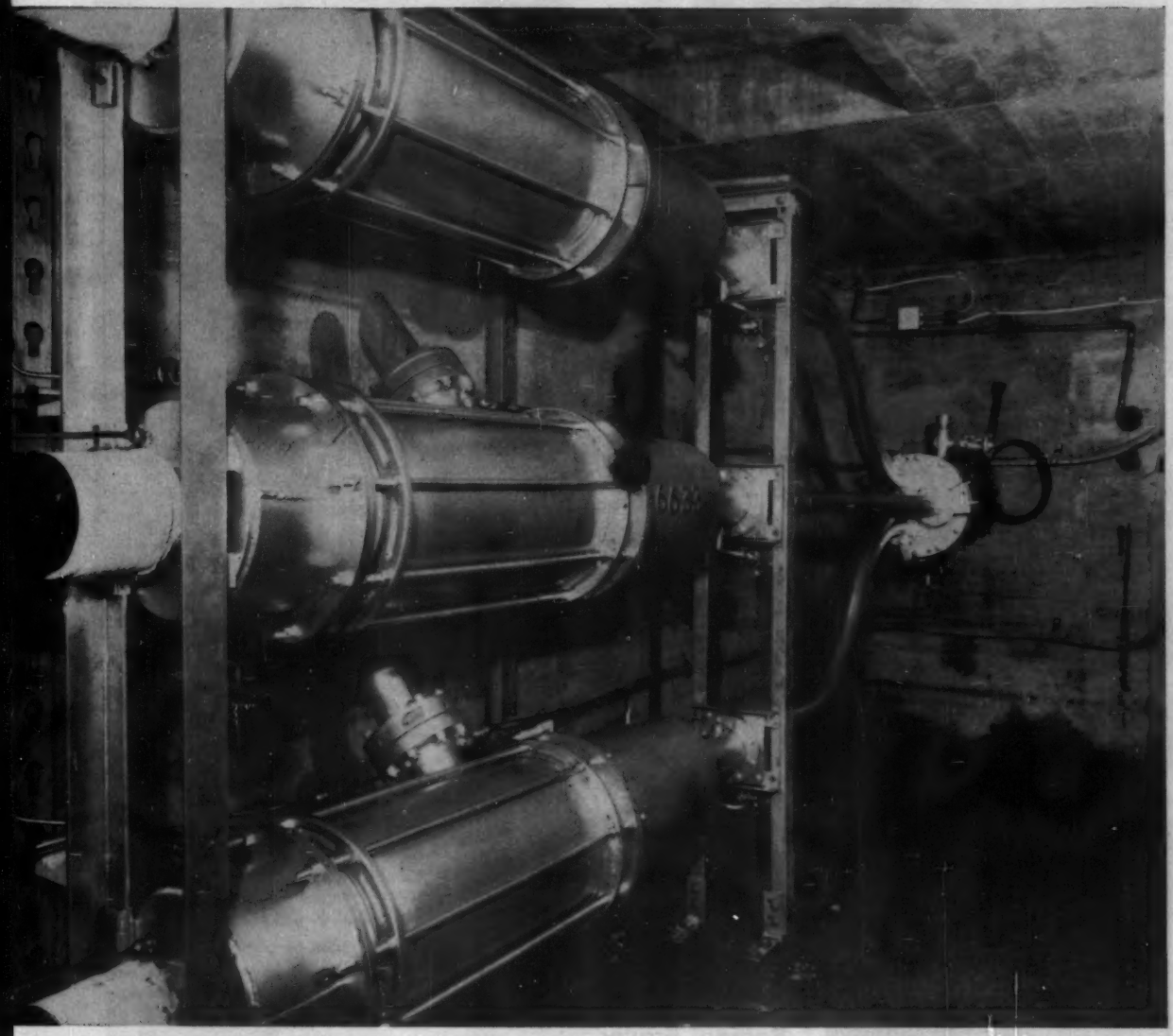


Lucite tubes fit in ends of the copper shield and extend over paper insulated lengths of pothead porcelains. Oil passage to the shield cavity is provided by Tygon tubing spirally wound between crepe paper insulation and Lucite tubes.



Additional crepe paper is applied to a uniform diameter over the Lucite-copper-Lucite assembly for overall joint insulation. Casing may be sealed by welding or by couplings.

SAVINGS.....
PRESSURE STOP JOINTS



Each joint consists essentially of two potheads enclosed in an oil filled non-magnetic steel casing.

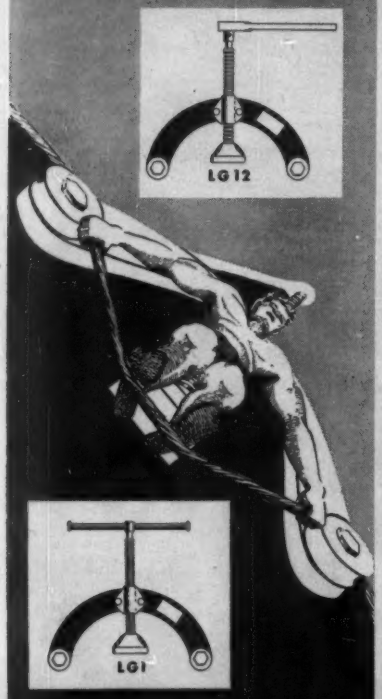
G & W ELECTRIC SPECIALTY COMPANY

3500 WEST 127TH STREET · BLUE ISLAND · ILLINOIS

ATJ581

LITTLE
Giant
SLACK PULLER

For pulling slack in a messenger you need a man with the strength of Hercules, the ruggedness of Atlas, the speed of Mercury . . . or a Little Giant Slack Puller.



If you need to pull slack in a messenger for any reason, either of the Little Giant Slack Pullers, the LG1 slip handle or the LG12 ratchet handle will do the job Quick, Easy and Safe.

WRITE OR PHONE

SERVING THE GROWING INDEPENDENT TELEPHONE INDUSTRY
CABLE SPINNING EQUIPMENT CO.
3100 TOPEKA AVE.
TOPEKA, KANSAS

Rack Mounted Oxygen Analyzer Recorder . . .

. . . checks flue gas to help improve combustion efficiency. Uses include testing for excessive stratification, heater leakage, and best location for sampling probes. Unit includes round- or strip-chart recorder.

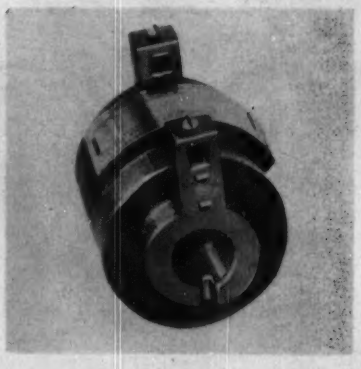
Operating between 32F and 120F ambient, the magnetic-type analyzer takes standard non-regulated 115-v 60-cycle power. Five-in. casters make the self-contained unit easy to move over rough flooring.

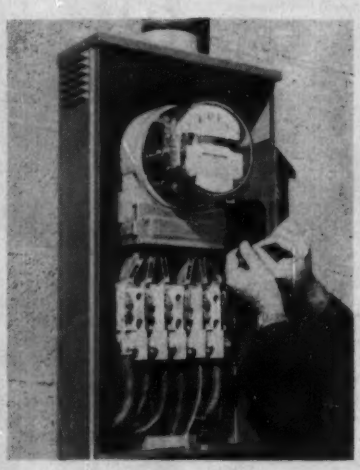
Leeds & Northrup Co, 4934 Stenton Ave, Philadelphia 44, Pa.

Molded Transformers . . .

. . . for indoor or outdoor metering give high accuracy at low burdens. Interchangeable with current transformers, they meet EEI size specifications for 600 v, and other standards for accuracy. A window-type, epoxy-resin transformer, the type "CPE" can be supplied with round- or flat-bar primary conductors, also with mounting brackets for switchboard use.

Standard Transformer Co, Warren, Ohio





Polyphase Connection Box

. . . for bottom-connected meters allows measurement of 200-amp loads by a standard, self-contained "A"-base polyphase meter without a current transformer. It uses heavy copper bus terminals suitable for 4/0 wire.

Easy to wire and mount, the box will accept 6- and 8- terminal, 3-phase meters. A bypass device is available for disconnecting meter to permit removal or "in-place" circuit tests without interrupting service.

General Electric Co, Schenectady 5, N. Y.

Radiant Broiler . . .

. . . for commercial cooking has quartz-glass heating element almost 100% pure. The stable element emits long-wave radiant heat which cooks without drying. Controls may be set for any kind of meat, fish, or poultry. It cooks quickly, and has applications from short orders to banquets.

Electriglas Corp, Bergenfield, N. J.

(*More New Equipment on page* 104)

Do you worry about plant expansion wiring costs

WHILE YOU'RE WAITING FOR A TRAIN?

If you're worrying about the costs of a new power distribution system — either in your present building or in that new plant you're planning — here's one way you can cut down on the worrying. Just specify Rockbestos A.V.C. (asbestos, varnished cambric insulated*) Interlocked Armored Cable. It will not only assure you of dependable service but will help you cut costs several ways. Here's how:

- Rockbestos A.V.C. Interlocked Armored Cable eliminates the need for costly conduits or ducts — it's easily installed on racks or hangers.
- Less layout time — less installation time mean important dollar savings.
- It permits planning for future installations — again at minimum cost.

Add to these direct cost-cutting advantages the long range economy of using a cable that gives you high current carrying capacity, that keeps maintenance at an absolute minimum and you can see the big savings possible when you specify and use Rockbestos A.V.C. Interlocked Armored Cable.

Get full details on dollar saving Rockbestos A.V.C. Interlocked Armored Cable — write now for complete specification and application data.

*Single conductors are N.E.C. type AVA

ROCKBESTOS PRODUCTS CORPORATION

NEW HAVEN 4, CONNECTICUT | NEW YORK, CLEVELAND, CHICAGO, PITTSBURGH, LOS ANGELES, DETROIT, ST. LOUIS, ATLANTA, DALLAS, OAKLAND, SEATTLE

ROCKBESTOS

A. V. C. Interlocked Armored Cable

For New Buildings, Expanding Existing Circuits, Relocating Old Circuits

These Climbers meet E. E. I. specifications.

Here's why M-S-A–Brooks Adjustable Climbers provide greater safety–durability

Gaff and tang forged in one piece! That's a statement that makes plenty of safety-sense to workers who depend on a small "tooth" of steel to support their weight high above the ground. This feature is exclusive with the M-S-A–Brooks Adjustable Climbers. And there's more to the story. The gaffs and leg irons are forged from high quality, medium carbon steel, heat treated to assure the proper balance of hardness, toughness and ductility.

Inspection plays an important role, too. Every leg iron and gaff is examined by the magnetic particles method. Statistical sampling is used for impact, absorption, Rockwell hardness and metallurgical tests. And all this means greater safety, longer wearing qualities . . . less maintenance.

Pads and straps are made of top grain steer hide with chrome leather reinforcement on the leg side of the calf pad. The result—maximum comfort on the job.

Write for complete details.

MSA
SAFETY EQUIPMENT HEADQUARTERS

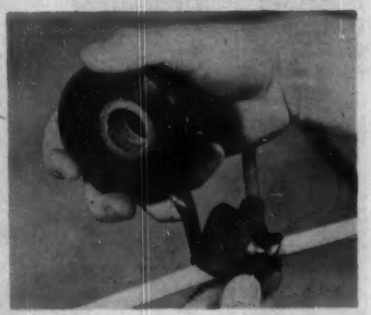
Call the M-S-A man on your every safety problem . . . his job is to help you

MINE SAFETY APPLIANCES COMPANY
201 North Braddock Avenue, Pittsburgh 8, Pa.
At Your Service: 76 Branch Offices in the United States
MINE SAFETY APPLIANCES CO. OF CANADA, LTD.
Toronto, Montreal, Calgary, Edmonton, Winnipeg, Vancouver, Sydney, N.S. • Representatives in Principal Cities in Mexico, Central and South America
Cable Address: "MINSAF" Pittsburgh

Brushless Alternator . . .

. . . has only one moving part—a solid metal rotor. Inert insulation makes it suitable in temperatures beyond 800F. Present design ranges from 0.5 to 125 kva. The explosion-proof alternator also features ultra-rapid acceleration and elimination of internal shorts.

Aerojet General Corp, Azusa, Cal.



Insulating Putty . . .

. . . pads corners on connectors, saving both time and tape. Two pieces of putty are crossed around splice, enclosing connector. Connection is then taped.

Minnesota Mining & Mfg Co, 900 Bush Ave, St. Paul 6, Minn.

More New Products

Explosion-proof switches feature double conduit openings. They have adjustable roller-arm actuators with non-sparking rollers, take ½- or ¾-in. conduit.—Micro Switch Div, Minneapolis-Honeywell Regulator Co, Freeport, Ill.

Electronic **program timer** for machines or processes controls on-and-off sequence of six operations. Time cycles run up to five min.—Electronic Processes Corp of California, 2190 Folsom St, San Francisco 10, Cal.

Low-sensitivity **vibration detector** for rotating equipment with more than normal vibration has a range of 0 to 4.5 G's. Housing is explosion proof.—Instrument Div, Robertshaw-Fulton Controls Co, 2920 N. Fourth St, Philadelphia 33, Pa.

4 IN 4

4 orders in 4 years for
Westinghouse gas turbines
as base load units in one station

As BASE LOAD GENERATING UNITS, an internationally known company installed a Westinghouse gas turbine-generator in 1954, another in '55, another in '56 and a fourth is now on order. These repeat installations are real evidence of reliable performance.

For use in your station . . .

. . . as a base or as an auxiliary power plant, the gas turbine offers you even more than reliability. For example . . .

Capital outlay is far lower than for any other type of turbine and there's no need for steam-generating facilities. Likewise, lower costs for installation, operating labor, maintenance and floor space.

By using the gas turbine exhaust as highly preheated combustion air, for feedwater heating or for generating steam, the overall heat balance of many stations can be greatly improved.

Challenge us to show you how a modern Westinghouse gas turbine might be the most economical solution to demands for greater capacity or increased operating efficiency. Contact your Westinghouse representative, or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-50597

YOU CAN BE SURE...IF IT'S Westinghouse

Look to
Superior for

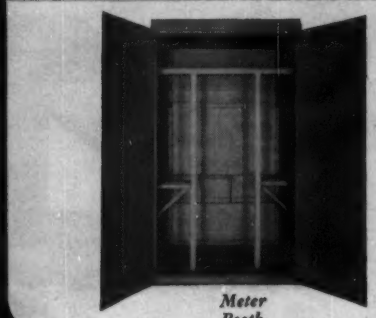
ENCLOSURES

Superior also
offers a complete line
of

TEST SWITCHES
TEST BLOCKS
SOCKET EQUIPMENT
TEST TABLES

Catalog 55 offers complete information on features, services, types and sizes. Write to:

SUPERIOR
SWITCHBOARD & DEVICES CO.
CANTON, OHIO
A subsidiary of
The Union Metal Manufacturing Company


Meter Booth

Current Transformer Enclosure

Double Door Enclosure

Onan ELECTRIC PLANTS

ELECTRIC PLANT
NEWS

Onan ELECTRIC PLANTS

Model 205AJ-1P
2,500 watts A.C. Carrying frame, recoil starter, outlet box and pilot light standard equipment.

Power company gets double use from Onan Plants

Portable Onan units handle maintenance jobs and standby service

This Onan Plant gets a good workout nearly every day on maintenance and construction jobs . . . providing plug-in power for electric tools and lights.

It's a big time-saver . . . but it's also a life-saver when power is cut off from a farm or home. Then the Onan Plant is rushed out to provide emergency electric power for such essential equipment as milking machines, lights, water system and appliances.

This kind of extra service keeps your customers happy and builds goodwill for you. Many dual-purpose units available . . . 500 to 10,000 watts A.C. Other units up to 75KW.

Write for complete specifications

D. W. ONAN & SONS INC.

2989 University Ave. S. E., Minneapolis 14, Minnesota

Onan ELECTRIC PLANTS

ELECTRIC PLANTS • AIR-COOLED ENGINES • GENERATORS • KAB KOOLER

CATALOGS–BULLETINS

For copies of literature listed, write Electrical World, 330 W. 42nd St, New York 36, N. Y. Refer to key number following description.

• **AMERICAN STANDARDS ASS'N:** A 32-page booklet entitled "1687 Reasons Why You and Your Company Should Support the American Standards Association" has been published by ASA. (EW-1198)

• **INDUSTRIAL LIGHTING:** A 36-page bulletin from Reflector & Lighting Equipment Manufacturers Standards Institute includes 11 RLM standard specifications for industrial lighting units. (EW-1199)

• **SPLICE INSULATING KIT:** Folder from Acme Wire Co describes kit which allows insulation to be poured into mold around cable splice. (EW-1201)

• **RECLOSER ACCESSORIES:** Bulletin CR1CA lists accessories for Kyle type R and W reclosers, and explains their applications. Line Material Industries. (EW-1202)

• **ELECTRIC BRAKES & CLUTCHES:** A 36-p illustrated report (WEB 6293) from Warner Electric Brake & Clutch Co fully explains two lines of d-c brakes for machinery. (EW-1203)

An 8-p booklet (WEB 6292) gives facts on brakes, clutches, and their controls. (EW-1204)

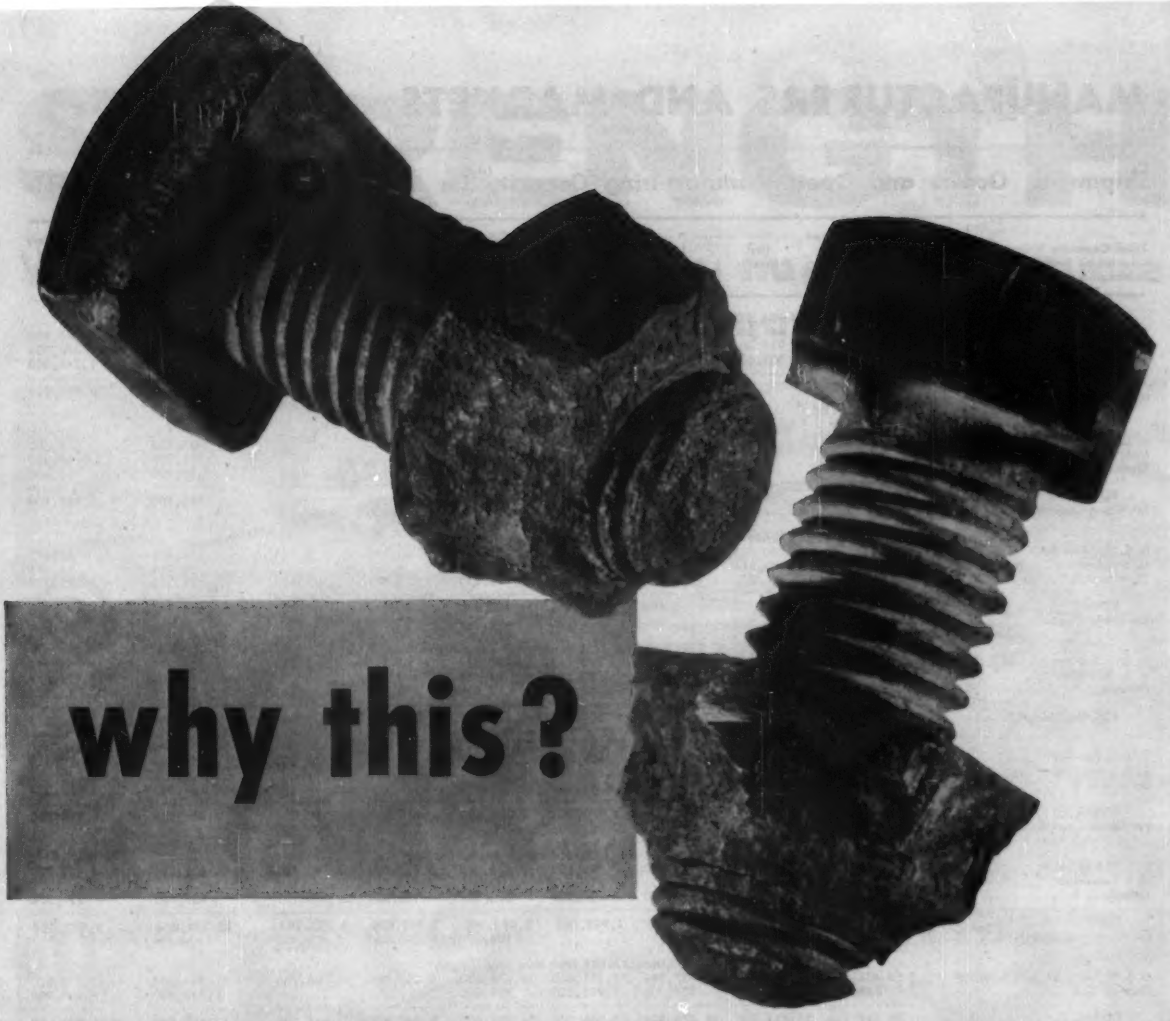
• **DC MOTORS & GENERATORS:** Catalog-folder No. SP-182 describes motors rated to 200 hp and generators up to 200 kw from Marathon Electric Mfg Corp. Dimensions, ratings, and cutaway drawings are included. (EW-1205)

• **FEEDWATER HEATERS:** C. F. Braun & Co has published a 16-p brochure on their spherical-head feedwater heaters. Photographs show construction. (EW-1206)

• **INSULATING RESINS:** Properties and uses of "Teflon" tetrafluoroethylene resins are the subject of a 32-p publication (A-5182) from Du Pont Co. (EW-1207)

• **CABLE:** A 4-p bulletin describing type RR power and lighting cable and tabulating complete physical dimensions in ranges up to 5,000 v is available from Triangle Conduit & Cable Co. (EW-1208)

• **CENTRIFUGAL FANS:** From Sturtevant Div of Westinghouse Electric Corp comes a 10-p catalog of series 8,000 centrifugal fans rated to 700,000 cfm. Catalog (No. 1121) explains airfoil blading. (EW-1209)



why this?

when new aluminum coating holds up so well

On galvanized structures, the rusting caused by atmospheric corrosion usually begins with the bolts and nuts. In time, this presents a serious maintenance problem. But now, at slight extra cost, you can obtain coated fasteners which are so rust-resistant that they outlast any other part of a galvanized structure. These fasteners are coated with Bethalume, Bethlehem's new aluminum coating.

The Bethalume hot-dip coating makes possible a much longer service life for fasteners by adding the corrosion resistance of aluminum to the strength of steel.

Bethalume coatings stand up especially well under "heat-corrosion," at lower cost than products customarily used. Moreover, the Bethalume coating is unusually uniform—not merely on the body of each bolt, but over the entire threaded portion as well, thus making possible threads which are clean and smooth-fitting.

We have a new illustrated booklet on the Bethalume coating, which describes its advantages in detail. If you would like to have a copy, just drop a line to the Bethlehem office nearest you.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

Shipments, Orders and Open Manufacturing Capacity for Electrical Equipment, 1956-1960

Total Capacity Shipped and on Order and Scheduled for Shipment	Shipped		Scheduled as of October 1, 1957				Total Scheduled for Shipment as of 10-1-57	New Orders Placed 1-1-57 to 10-1-57
	1956	First 9 Months of 1957	Last 3 Months of 1957	1957	1958	1959	1960 and Later	
LARGE STEAM TURBINE-GENERATORS[2] (10,000 Kw and Larger)[4]								
U. S. El Pwr Sys[1]	6,610,400	6,644,500	4,424,500	11,069,000	14,003,300	10,290,500	6,451,500	35,169,800	7,978,900
U. S. Industrials	391,800	925,800	376,300	1,302,100	142,500	75,000	600,000	1,193,800	657,500
Outside U. S.	652,600	503,600	15,600	519,200	1,330,400	1,640,800	50,000	3,036,800	1,341,500
TOTAL	7,654,800	8,073,900	4,816,400	12,890,300	15,476,200	12,006,300	7,101,500	39,400,400	9,977,900
Est. Open Capacity[3]					100,000	1,300,000	9,000,000[9]		
SMALL STEAM TURBINE-GENERATORS[5] (4,000 to 9,999 Kw)[4]									
U. S. El Pwr Sys[1]	130,400	38,100	7,500	45,600	28,100			35,600	15,600
U. S. Industrials	80,000	103,100	39,400	142,500	61,300			100,700	39,400
Outside U. S.	91,200	62,500	26,300	88,800	58,900			85,200	45,100
TOTAL	301,600	203,700	73,200	276,900	148,300			221,500	100,100
Est. Open Capacity[3]					200,000	500,000	600,000[9]		
STEAM GENERATORS (450-Psi Pressure and Higher)[6]									
U. S. Elec Pwr Sys[1]	54,514	66,838	31,496	98,334	102,318	40,395	2,125	176,334	46,671
U. S. Industrials	15,175	23,514	2,828	26,342	12,561	4,825		20,214	14,472
Outside U. S.	13,518	6,071	8,299	14,370	15,855	3,671	485	28,310	12,357
TOTAL	83,207	96,423	42,623	139,046	130,734	48,891	2,610	224,858	73,500
Est. Open Capacity[3]					14,000	82,000	154,000[9]		
STEAM GENERATORS (450 Psi Pressure and Higher)[6]									
U. S. El Pwr Sys[1]	64,183	77,378	36,334	113,712	118,788	46,325	2,363	203,810	53,393
U. S. Industrials	17,108	28,923	3,201	32,124	14,438	5,769		23,408	16,617
Outside U. S.	15,293	6,649	9,472	16,121	17,889	4,250	504	32,115	13,965
TOTAL	96,584	112,950	49,007	161,957	151,115	56,344	2,867	259,333	84,175
WATERWHEEL GENERATORS[2] (4,000 Kw and Larger)[4]									
U. S. El Pwr Sys[1]	1,085,300	1,259,700	599,300	1,859,000	2,068,100	976,600	158,000	3,802,000	1,229,600
U. S. Industrials									
Outside U. S.	86,500	34,000	14,000	48,000	153,500			167,500	50,500
TOTAL	1,171,800	1,293,700	613,300	1,907,000	2,221,600	976,600	158,000	3,969,500	1,280,100
Est. Open Capacity[3]					100,000	1,700,000	3,300,000[9]		
HYDRAULIC TURBINES (5,000 Horsepower and Larger)[7]									
U. S. El Pwr Sys[1]	1,223,700	1,326,400	1,309,700	2,836,100	2,235,000	3,482,600	3,795,100	10,822,400	4,621,700
U. S. Industrials									
Outside U. S.	11,400	40,000	67,300	107,300	230,300	108,000		405,600	221,000
TOTAL	1,235,100	1,366,400	1,377,000	2,943,400	2,465,300	3,590,600	3,795,100	11,228,000	4,842,700
Est. Open Capacity[3]					500,000	1,000,000	2,000,000[9]		
POWER TRANSFORMERS (501 Kva and Larger)[8]									
U. S. El Pwr Sys[1] and Industrials	54,438,000	53,614,000	17,637,000	71,251,000	24,276,000	8,337,000	1,046,000	51,296,000	43,032,000
Outside U. S.	744,000	1,158,000	837,000	1,995,000	395,000			1,232,000	2,003,000
TOTAL	55,182,000	54,772,000	18,474,000	73,246,000	24,671,000	8,337,000	1,046,000	52,528,000	45,035,000
Est Open Capacity[3]				5,000,000	55,000,000	71,000,000	79,000,000[9]		

[1] U. S. Electric Power Systems. [2] Figures in 1,000 lb steam per hr. [3] Estimated open manufacturing capacity for production of additional units. [4] Manufacturers' rating of generators. [5] Figures in heat output, millions Btu per hr. [6] Figures in horsepower. [7] Figures in kilovolt-amperes. [8] Figures in Kilowatts. [9] Estimated open manufacturing capacity only for 1960.

Industry Expansion Plans Hit 52,928 Mw

- EEI Survey reveals units totaling 16,250 Mw will start operating in 1958; balance by 1960 or later
- Average size of thermal turbine-generator units 100 Mw and larger is now 175 Mw
- Hydraulic turbine orders may soar 240% over '56 total

Electric utilities' expansion programs as they relate to generating equipment going into commercial operation will reach a record breaking 52,928 Mw from January 1, 1957, through 1960 and later. The previous high of 49,528 Mw covered the period of January, 1956, through 1959 and later.

This was one of several important figures revealed by Edison Electric Institute's 22nd Semi-Annual Electric Power Survey, which covers steam turbine-generators, steam generators, water-wheel generators, hydraulic turbines, and power transformers. The data, compiled as of October 1, 1957, relate to shipments, scheduled production and estimated open manufacturing capacities for 1957 through 1960. It includes totals for U. S. electric power systems and industrials, and foreign installations.

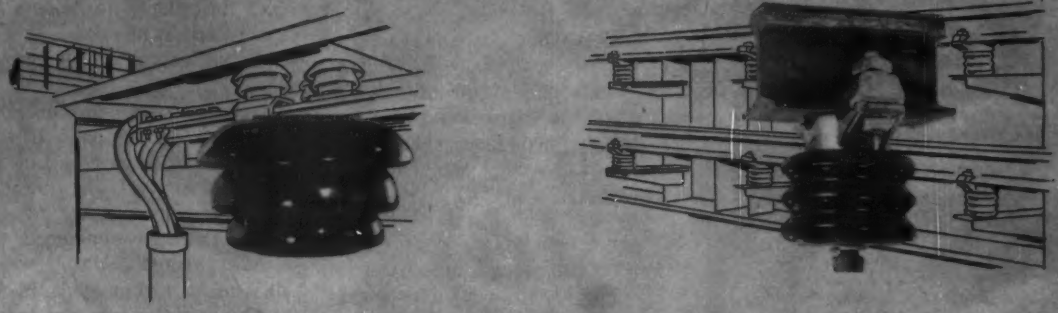
A breakdown of especially significant facts revealed by the survey is presented in the following paragraphs.

(*Continued on page* 110)

STRENGTH

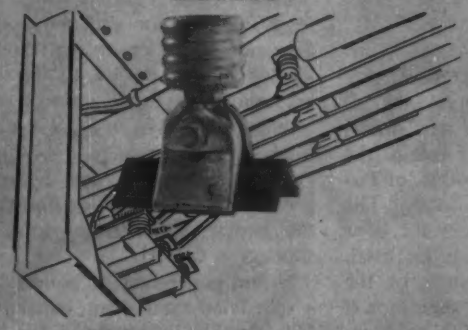
Which kind of strength do you need in insulators for traveling-contact equipment?

MAXIMUM ELECTRICAL STRENGTH



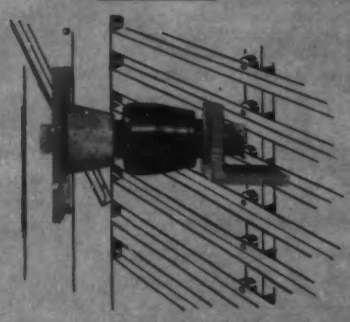
Wet-process porcelain insulators, such as these, offer outstanding electrical properties for high-voltage contact-rail insulation. Especially recommended where dirt, moisture, and other contaminants prevail.
Also available are dry-process porcelain units for power circuits.

MAXIMUM IMPACT STRENGTH



Molded polyester-fiberglass insulators and fabric-reinforced insulators of this general type have exceptional impact strength and vibration-resistance combined with good electrical properties. Tailored to resist chemicals, thermal shock, weathering.

MAXIMUM TENSILE STRENGTH



Molded Giant Strain insulators, adaptable to miniaturization where space is restricted, offer unusual mechanical strength. A very economical insulator having diverse applications.

TO HELP YOU DECIDE . . .

. . . on the right combination of properties to meet your insulator needs, Delta-Star engineers from coast to coast invite your problems. Phone the nearest Delta-Star district office or write to Electric Service Works, Delta-Star Electric Division, H. K. Porter Company, Inc., 17th & Cambria Sts., Philadelphia 32, Pa.

H. K. PORTER COMPANY, INC.

DELTA-STAR ELECTRIC DIVISION

Porter Divisions: Cleveland, Connors Steel, Delta-Star Electric, Henry Disston, Leschen Wire Rope, Quaker Rubber, Refractories, Riverside-Alloy Metal, Vulcan Crucible Steel, W-S Fittings, H. K. Porter Company (Canada) Ltd.

NEW

high-speed high-power lightweight

CONDUIT BENDER

- *90° bend with one ram stroke*
- Bends 4" conduit 90° in 4 minutes with No. 798 Power Pump shown
- Handles 10 conduit sizes ½"–4"
- One man wheels it from job to job on its specially designed pipe supports
- Fast setup and operation by one man
- Two-speed power pumps for fast approach . . . 90° bend in 4" conduit as fast as 30 sec with No. 797 Pump
- High-strength aluminum and steel construction for minimum weight, maximum strength
- Universal pipe supports rotate to handle all conduit sizes
- Front insertion and removal of conduit
- A dozen advanced features

WRITE FOR BULLETIN E-224

GREENLEE TOOL CO.
1812 Columbia Ave. • Rockford, Ill.

Industry Expansion

(*Continued from page* 108)

Expansion

• In 1958 units totaling 16,250 Mw are scheduled to start operating in U. S. electric utilities. This amount is the largest for any single year and almost doubles this year's (1957) amount.

• The average size of thermal turbine-generator units 100 Mw and larger is now 175 Mw. Units of 250 Mw and larger constitute 24% of the expansion planned for January 1, 1957, through 1960 and later. Units under 100 Mw equal 11.8% of the expansion program. Six months ago their share was 12.4%, and a year and a half ago it was 14.2%.

• Open manufacturing capacity for turbine-generators under 100 Mw has been reduced since April 1, 1957. The area has been assigned to other production. The capacity relates to machines for all types of purchasers: U. S. utilities, industrials, and foreign shipments.

• Largest machine ordered so far is a 500 Mw turbine-generator for TVA's Widows Creek No. 7 unit.

New Orders

New orders for hydraulic turbines in the first nine months of 1957 total 4,842,700 hp for all types of purchasers. If new orders continue at this rate for rest of the year, they will reach 240% of last year's 2,699,200 hp total. The Niagara project accounts for over 54% of the 4.8 million hp total. The 13 hydraulic turbines for the Niagara project are the largest ordered so far—200,000 hp each, or a total of 2.6 million hp.

Hydraulic turbine orders total 11,228,000 hp and are scheduled for shipment as of October 1, 1957 for all types of purchasers. This exceeds by 16% the previous peak of 9,679,500 hp as of April 1, 1957.

Shipments

Scheduled shipments in 1958 for both thermal and hydraulic generating capacity stands at 17,846 Mw, exceeding the prior high of six months ago of 17,440 Mw for utility, industrial and foreign installations. Scheduled for shipment in 1957 is a total generating capacity of 15,074 Mw, including large and small steam turbine generators and waterwheel units. Through September 63% (9,571 Mw) were shipped.

Steam turbine-generator shipments of the large (10 Mw and larger) units will chalk up a 1957 total of 12,890 Mw for all types of purchasers. First nine month's shipments came to 63% of this amount, or 8,074 Mw.

Exclusive of the steam turbine-generators for use with nuclear reactors, about 6,000 Mw are on order, for which no boilers have been ordered at this date. This runs about the same as the previous period.

Large size steam turbine-generators had a net slippage of about 1,122 Mw, from year end of 1957 through 1960 for U. S. power systems. Shipment slippage of 1,822 Mw was partially balanced by a 700 Mw gainage.

Of steam turbine-generators of 300 Mw and above in the industry expansion program 19 units are on order—a total of 6,505 Mw or 14.1% of the total for the period January 1, 1957 through 1960 and later. Six months ago 15 units were on order, totaling 5,040 Mw, or 12.5% of that period's total.

In the 250-Mw and above class, 37 units are on order totaling 11,245 Mw or 24.3% of the total. Six months ago the 31 units on order totalled 9,225 Mw or 22.9% of the total.

For the thermal and hydraulic generators going into operation on the expansion program, total net slippage is 649 Mw.

Steam generators or boilers have a scheduled total steam capacity of 139,046,000 lb per hr in 1957 for all purchasers. This exceeds the previous high of 119,472,000 lb per hr shipped during 1952. During the first nine months of this year 69% (96,423,000 lb per hr) were shipped. Boilers for U. S. power systems had a net slippage of 4,675,000 lb per hr of steam from the year end of 1957 to 1960.

The ratio of millions of Btu per hr to thousands of pounds of steam per hour is 1.15:1 (259,333,000,000: 224,858,000), all purchasers.

Hydraulic turbines scheduled for shipment to all types of purchasers in 1959 totalled 3,590,600 hp, exceeding by 12% the record ship-

ment of 3,215,900 hp in 1954. Shipments for 1957 total 2,943,400 hp. During the first nine months 53% (1,566,000 hp) were shipped. For U. S. power systems there was a net slippage of 455,000 hp from the year end of 1957 to 1960.

Water-wheel generators scheduled for 1958 shipment to all purchasers will total 2,222 Mw, exceeding the high shipment of 1,953 Mw established in 1952. This year's total shipments will be 1,907 Mw, of which 68% (1,294 Mw) were shipped the first nine months. U. S. power systems had a net slippage of 131 Mw.

Power transformer shipments for all types of purchasers claim a 1957 total of 73,246 Mva, beating the 1954 record of 59,606 Mva. Shipments during the first nine months reached 54,772 Mva or 75% of the year's total.

Nuclear Plants

The total of seven steam turbine generators for nuclear plants remains the same as a year ago (EW, Dec. 10, 1956, p 218). Total capacity is 1,009 Mw, a slight increase because the Yankee Atomic Electric Co's generator has been boosted from 125 to 145 Mw.

Information for the EEI Survey was furnished by 19 of the country's leading manufacturers of heavy electric power equipment. Data on steam turbine-generators and water-wheel generators are based on manufacturers' name plate ratings.

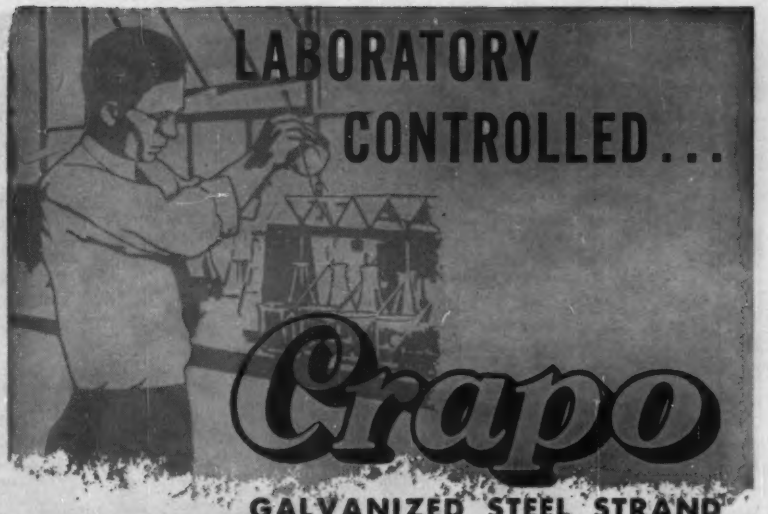
Peak and reserve capacity data developed by the survey will be found on page 66 of this issue.

AccuRay Will Automate Battery Plate-Pasting

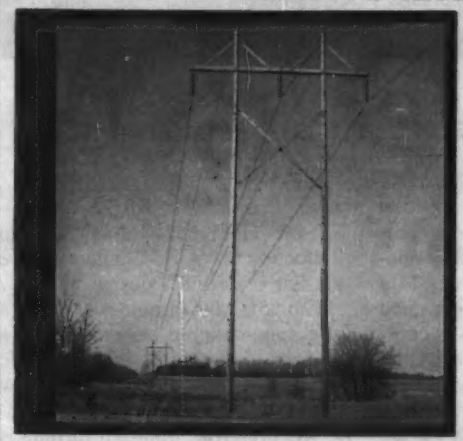
Automatic control of plate-pasting operations for lead-acid storage battery production will soon be installed at C & D Batteries, Inc, Conshohocken, Penna.

The AccuRay system will replace time-consuming weight sampling of plates to insure uniformity and proper electrical characteristics. It will automatically measure and control the amount of lead oxide for each battery plate.

(*More M&M on page* 112)



GALVANIZED STEEL STRAND



YOUR ASSURANCE OF HIGH QUALITY, LONG LIFE AND LOW COST

Close laboratory control over each step in manufacture has established Crapo Galvanized Steel Strand as a product of highest quality and dependability. You benefit through longer service life and lower ultimate costs.

Heavy, uniform, tightly-bonded coatings of commercially pure zinc, applied by the famous Crapo methods, withstand the punishment of construction, provide maximum resistance to corrosion and contribute to over-all economies.

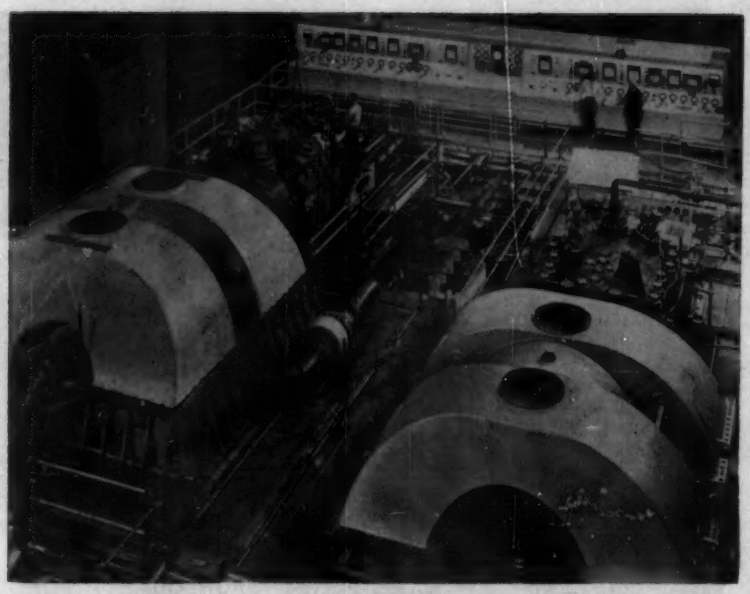
For OVERHEAD GROUND WIRE . . .
CRAPO Weldless Galvanized Steel Strand

The most practical and economical strand for shielding transmission lines against lightning. Maximum strength and high fatigue endurance, inherent in Crapo Weldless Strand, provide that extra safety factor so important in overhead ground or static wire.

For GUYS and MESSENGER . . .
Crapo Galvanized Steel Strand. Made to highest standard specifications . . . a size and breaking strength to meet all practical needs.

Contact your jobber or write for descriptive folder.

INDIANA STEEL & WIRE CO., INC.
Muncie, Indiana



New Design Makes Turbines Compact

These 150-Mw (left) and 100-Mw (right) double-flow, tandem-compound reheat turbines feature side-crossunders, an Allis-Chalmers Mfg Co original development designed to make cross-compound units compact. The machines are on Allis-Chalmers' new West Allis steam turbine assembly and test pit. Shop pipe on the 150-Mw unit shows location of side-crossunder. They are permanently installed in the lower half, and need not be removed for turbine inspection. All 75- to 220-Mw tandem reheat ratings now in production at Allis-Chalmers have this side-crossunder design.

The 150-Mw turbine will drive a fully supercharged generator. It is the first of four ordered by Public Service Co of Indiana for its New Albany station. The 100-Mw AIEE-ASME preferred standard turbine is one of three for the Louisiana and Texas stations of Gulf States Utilities Co.

M & M BRIEFS

Osmose Wood Preserving Co of America, Inc, Buffalo, N. Y. has upped prices 50¢ per gallon on Osmoplastic preservative for standing poles. Coverage recommendation is now five gallons for 35 poles of 36-in. circumference.

Four Wheel Drive Auto Co, Clintonville, Wis., has increased by approximately 5% the prices of most of its new truck models, effective Dec. 1, because of rising material and labor costs.

Ray-O-Vac Co stockholders approved the plan for its acquisition as a division of Electric Storage Battery Co (EW, Nov. 4, p. 108). The approval calls for an exchange of one share of ESB common stock for each two shares of Ray-O-Vac stock outstanding.

General Motors Corp, Electromotive Division at La Grange, Ill., demonstrated recently a 1,000 kw Electro-Mobile power car. The unit delivered full power, just 30 sec after startup, to lines of Public Service Co of Northern Illinois. The demonstration was made before an AIEE group inspecting the Division's manufacturing facilities.

Wire and Cable "Bible" Is Ready in 2nd Edition

Rome Cable Corp, Rome, N. Y., has published a 393-page second edition of its wire and cable manual, the "Rome Cable Manual of Technical Information."

The cable "bible" reflects technical advances since the first edition appeared 10 years ago, and the changes in industry standards, regulations, and practices. Emphasis is on new materials and field methods.

A section on cable installation and practices is new. The Wire and Cable Technical Tables now give information on aluminum conductors, and sheath, insulation, and conductor materials. Rome says the section called Wire and Power Cable Engineering Calculations and Data is "a comprehensive engineering guide to cable design, selection, and operation."

Book sales are being handled from the company's headquarters at Rome, N. Y.

Copper Finish Put on Circle's Sheathed Cable

Copper - colored non - metallic sheathed cable has been made available by Circle Wire & Cable Corp, a subsidiary of Cerro de Pasco Corp, at Maspeth, N. Y. The first 1,000-ft of this Cirtex cable came off the finisher recently.

The copper-finished cable, according to a company spokesman, costs no more than regular Cirtex, provides a smoother and more attractive finish that has proved easier to pull through studding. Circle's engineers also report that the new finish is more resistant to scuffing.

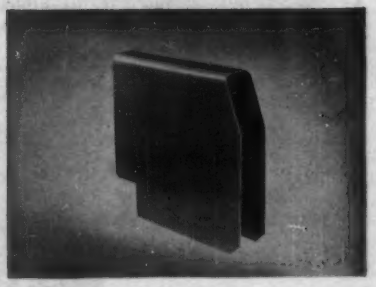
Uptegraff Mfg to Add Impulse Generator

Installation of a 300-kva production line impulse generator for testing pole-type, oil-filled, single-phase transformers of 10 to 167-kva is planned by R. E. Uptegraff Mfg Co, Scottdale, Pa. A new building for the testing unit is about completed and the generator installation will be finished in early 1958.

C-D-F HANDLES THE COMPLETE JOB An oil circuit breaker component is made from two Dilecto laminated plastic tubes, with a threaded ring joining the assembly. From raw materials to finish machining C-D-F does it all!

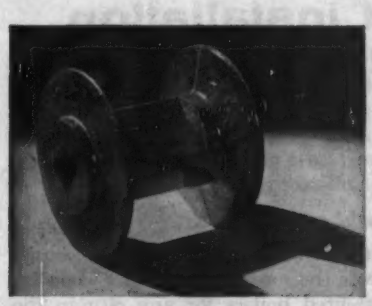
C-D-F KNOWS HOW TO MACHINE PLASTICS. A bus bar gets a covering of molded Dilecto over copper supplied by the customer. The plastic ends are skillfully trimmed on a smooth saw.

C-D-F MOLDS MANY SPECIALTIES. This shaft insulator for a circuit breaker is molded from C-D-F's cloth-based industrial thermosetting plastic, Celoron. Note complexity of mold, clean detailing.



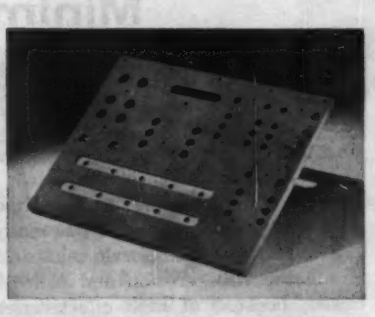
C-D-F USES MODERN METHODS. Large quantities of arc chute barriers are made from paper-based Dilecto. Operations include pressing, cutting, post-forming and trimming.

Dependable equipment relies on C-D-F insulation!



C-D-F OFFERS UNIQUE MATERIALS. This contact shaft for an air circuit breaker is another example of molded C-D-F Celoron used in switchgear because of its high impact strength.

C-D-F IS A SKILLFUL ASSEMBLER. Made from Grade C rolled Dilecto tubing, these pots are turned, bored, slotted. Then a macerated plastic end is inserted and arc resistant varnish finish applied.



C-D-F UNDERSTANDS THE ELECTRICAL INDUSTRY'S NEEDS. Precisely machined to close tolerances, Dilecto panel boards guarantee dependable insulation, help designers save space.

See our catalog in Sweet's Design File for basic product data and sales offices. Write for detailed information, or send us your print for quotation.

CDF

CONTINENTAL-DIAMOND FIBRE

A SUBSIDIARY OF THE Bakelite COMPANY • NEWARK 15, DELAWARE

Selective Particle Acceleration

Inlet cell vane design produces smooth, even deflection and controlled acceleration of air stream. Smaller lighter dust particles pick up speed quickly, larger particles accelerate more slowly. Both attain enough velocity for good separation, but not enough to cause erosion damage. This is the Hagan principle of Selective Particle Acceleration.

Installation of fully pre-assembled Hagan Dust Collector

Minimum erosion, fast installation...

HAGAN MECHANICAL DUST COLLECTOR

Fast installation is one of the features of the new Hagan Dust Collector. Recently a collector for a 75,000 lb/hr boiler was erected in less than fourteen hours. With the duct work connected up, it was ready to go.

The Hagan vaned-nozzle inlet design has practically eliminated tube erosion and collection efficiencies are raised, because of high effectiveness in the 1 to 10 micron range. Check these cost and trouble-saving features:

- Tube erosion virtually eliminated. Hagan Dust Collectors are *guaranteed* against tube failure due to erosion *for two full years.*
- Pressure drop 20% lower than conventional multiple tube collectors based on same efficiency.
- Hexagon shaped tops—This honeycomb shape permits close tube packing, eliminates dust trapping and clogging.
- Easy maintenance—Ease of access to all parts makes the Hagan Dust Collector easy to inspect.
- Lower overall height requirements.

Add to these the fact that the Hagan Dust Collector's efficiency easily meets the most rigid existing code requirements for coal fired boilers for any city in the United States.

Write for specifications, or a Hagan engineer will be glad to discuss your particular requirements.

HAGAN CHEMICALS & CONTROLS, INC.

HAGAN BUILDING, PITTSBURGH 30, PENNSYLVANIA
DIVISIONS: CALGON COMPANY, HALL LABORATORIES
IN CANADA: HAGAN CORPORATION (CANADA) LIMITED
OFFICES IN: MONTREAL, TORONTO, VANCOUVER, EDMONTON

ELECTRICAL BUSINESS OUTLOOK

Electrical World
DECEMBER 9, 1957

Facts Behind the Figures . . .

. . . in Edison Electric Institute's 22nd Semi-Annual Electric Power Survey back up what the figures show: that the U. S. electric utility industry is expanding its capabilities to keep pace with growing peaks.

In 1958 about 16,250 Mw of generating capacity are scheduled to go on the line in U. S. electric utilities. Simple figure comparison shows that this is an all-time record. But behind the figures is a fact that makes 1958 loom even larger.

Largest addition to U. S. generating capacity ever made before came in 1955. In that year 12,542 Mw went on the line. But in '55 about 2,500 Mw of this total came from private facilities to serve the Atomic Energy Commission—Ohio Valley Electric Corp and Electric Energy Inc. And Tennessee Valley Authority's 1955 expansion to serve AEC would push that figure much higher. Nothing like this boost is included in the picture for next year, since AEC cut back its use of kwhr in mid-1957. The expected figure for 1958 may be reduced a bit by construction delays, but even without the help of OVEC and EEInc, it will stand head and shoulders above 1955. It almost doubles the 1957 figure.

More Mw were ordered during the first nine months of 1957 than were shipped. New orders accounted for 9,224 Mw. Shipments totalled 7,941 Mw.

The large figure (2,068 Mw) for 1958 shipments of waterwheel generators is a development of the high rate of ordering in '55 and '56, when orders reached 1,759 and 1,746 Mw. First nine months of '57 saw 1,230 Mw ordered.

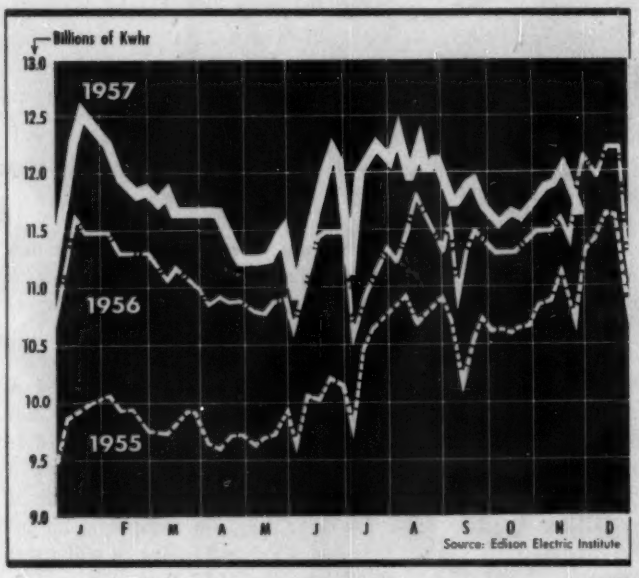
Power transformer shipments will be down in '58. The total of large transformers scheduled for shipment in the U. S. next year is 24,276 Mva, although with 55,000 Mva open capacity and a shorter lead time, more orders can be expected. A slower rate of orders has been noted from quarter to quarter of this year. But 1957's total towers above all previous records at more than 71,000 Mva. After such a year, there is only one way to go.

Utilities are getting less optimistic on peak loads forecast to 1960. This is the first fact that springs from EEI's projections into the future. To take one example, the U. S. December peak for 1959 is projected in the current survey as 131,624 Mw for median hydro conditions. A year ago that peak was seen at 132,477 Mw, and six months ago at 132,210 Mw. The 1959 summer peak is now put at 127,721 Mw, down from 128,345 Mw forecast a year ago and 128,109 Mw six months ago.

Two regions of the U. S. already have summer peaks, the South Central and the Southwest. In addition, the West Central and North Central will just about equalize summer and winter peaks by 1960 if the forecast holds up. West Central region's December peak will be 3,094 Mw while its summer peak will hit 3,061 Mw. North Central will be even closer: Winter—16,080 Mw; Summer—16,076 Mw. And the rise of summer peaks is also marked in the Eastern division of the Northwest region, where a winter peak of 2,037 Mw will be approached by the summer peak of 2,018 Mw in 1960.

Turn to pages 66 and 108 for more data on the EEI survey. In the news section (page 66) is information from the utilities. Information from electrical manufacturers is covered in "Manufacturers and Markets" (page 108).

STATISTICS



OUTPUT

Week ended Nov. 30, 11,613,000,000 Kwhr—down 3.8% from same week last year due to shift in Thanksgiving holiday.

Per Cent Change From Previous Year

	Nov. 16	Nov. 23	Nov. 30
Total U. S.	+3.1	+ 6.1	−3.8
New Eng.	+2.0	+ 6.7	−6.6
Mid. Atlan.	+1.3	+ 6.2	−4.6
Cent. Ind.	+1.8	+ 6.2	−7.2
West Cent.	+4.9	+ 9.3	−2.5
Southeast	+4.0	+ 3.7	−3.8
South Cent.	+6.0	+ 8.2	+4.7
Rocky Mount.	+1.7	+ 5.1	+1.8
Pacific			
NW	+2.9	+ 3.4	−1.9
SW	+6.5	+10.8	−2.0

Seasonally Adjusted Index 225.7
Week Ago 227.1
Year Ago 224.9

Atomic Energy Commission requirements—1,050,000,000 Kwhr (Electrical World estimate). Excluding AEC, output decrease was 3.5%

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	Sept.	126.24	125.75	118.66	6.4
Peak—Class 1 Systems. million kw	June	104.6	97.8	97.2	7.6
Estimated Dec. '57 Peak	Sept.	112.8	113.0	114.8	− 1.8
Production—billion kwhr	Sept.	51.57	55.45	48.82	5.6
Hydro		9.28	10.03	8.96	3.6
Fuel		42.29	45.42	39.86	6.1
Sales—billion kwhr	Aug.	49.79	48.09	46.24	7.7
Residential		13.05	12.59	11.60	12.5
Commercial		8.76	8.54	7.94	10.3
Industrial		25.06	24.07	23.93	4.7
Other		2.93	2.88	2.77	5.8
Fuel Consumption	Sept.				
Coal—million tons		12.75	13.33	12.45	2.4
Oil—million barrels		5.64	5.79	5.20	8.5
Gas—billion cu ft		137.60	160.96	124.63	10.4
Net Income Class A & B Co's $—million	Sept.	116.13	108.86	108.33	7.2
Residential Customers—millions	12 mos	46.49	46.35	45.25	2.7
Revenue per kwhr	ended	2.57¢	2.58¢	2.61¢	− 1.5
Avg kwhr per customer	Aug. 31	3,104	3,082	2,915	6.5
Avg annual bill		$79.77	$79.52	$76.08	4.9

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	Oct.	147	145	151	− 2.6
ENR Construction Cost	Nov.	154.6	154.7	147.6	4.7
BLS Cost-of-living	Oct.	121.1	121.1	117.7	2.9
New Orders for Machinery (1950 = 100)	Oct.	119	141	139	−14.4
NEMA Sales					
Insulation materials	Sept.	135	134	141	− 4.3
Electric appliances		97	86	101	− 4.0
Wholesale prices	Oct.				
Motors and generators		143.0	143.3	136.9	4.5
Transformers and regulators		150.8	150.8	144.8	4.1
Switchgear and fuses		170.9	170.6	161.9	5.6
GNP—annual rate—$ billion	3rd qtr.	439.0	434.3	416.7	5.4

Maine Rate Hike Contenders Get 4-2 Verdict

Central Maine Power wins on two counts, is over-ruled on four, in its petition to the state's commission for a $2.3-million annual rate increase

After over-ruling Central Maine Power Co's petition for a rate increase on four exceptions and sustaining two others, Maine's Supreme Court turned the request for a $2,321,000 a year hike back to the Public Utilities Commission. The court order mentioned no specific amount.

In the decree by Justice Robert B. Williamson, the court sustained the commission in:

- Disallowing normalized taxes arising from accelerated depreciation.
- Disallowing additional fuel costs.
- Disallowing merchandising department losses.
- Setting rate of return.

But the court sustained the company on additional wage costs and on promotional expenses disallowed in part by the commission.

Tax Deferral—The company's proposal on treatment of taxes arising from the use of Section 167 was to normalize the taxes above the line as an expense for rate-making purposes, but to deduct the accumulated balance of the deferred taxes from the value of the property in establishing the rate base.

The commission contended that the deferral would extend into the unforeseeable future and that, in effect, a permanent reduction of taxes would take place. However, if taxes would increase by reason of the absence of the normalization, the company could ask the commission for a rate increase.

The court decision said:

"From our reading of Section 167 of the Code, supra, and the House and Senate Committee reports thereon, to which the company had directed our attention, we are unable to find an intent on the part of Congress that the ratepayers of a regulated utility should provide an interest free loan to the company through present payment of a deferred tax. We must not read more into the Act than reasonably may there be found."

The court's contention in this matter is technically correct. But it should also be noted that neither is there any indication that Congress intended to exclude regulated utilities from the benefits arising from the use of Section 167.

The House committee report on the Internal Revenue Code of 1954 said:

"For all segments of the American economy, liberalized depreciation policies should assist modernization and expansion of industrial capacity, with resulting economic growth, increased production, and a higher standard of living."

As to the commission's concern that the deferral was permanent and that, in effect, a lower tax rate was in effect, again the House committee report noted:

"The changes made by your committee's bill merely affect the timing and not the ultimate amount of depreciation deductions with respect to a property."

It is of interest to note that the court sustains the commission's position that the utility's customers should not provide an interest-free loan to the company through the action of a tax deferral. Yet, it also goes along with the commission in approving the normalization of taxes for accelerated amortization.

It would appear that, apart from the difference in timing between Sections 167 and 168, the position of the customer with reference to the company is identical. However, it should be clearly understood that the customer provides nothing in the way of an interest-free loan. The rates remain the same, and if any interest-free loan is provided it is given by the U. S. Government through the action of deferring taxes to a later date.

Another point quickly dismissed was the fact that since the government does not forgive taxes, the use of actual taxes arising from the use of liberalized depreciation will unduly discriminate in favor of the existing ratepayers at the expense of those who take service from the company in the future.

Fuel and Wage Costs—In sustaining the commission's disallowing additional fuel costs, which rose materially over the level of the test-year period, the court held that no one could foretell which way fuel costs would go and that while they had risen substantially they could also decline.

It should be noted that the commission adopted the average cost of fuel for the test year, which was below the year-end price, and quite considerably below the cost of oil in January, 1957.

The court, to a degree, based its decision on the fact that, ". . . the substitution of fact for prophecy at any point in the process of rate making is an advance on the road to certainty."

While there may be temporary fluctuations in the cost of fuel, equally there is little doubt that both because of inflationary pressures and the continuing world demand for oil its prices must inevitably rise.

Concerning wages, the court sustained the company on the grounds that while the increase in wage rates was subsequent to the test year period, the contract for this wage increase was signed in 1956. The court agreed that the certainty of this increase taking place merited granting these additional costs.

Promotional Expense—The commission disallowed some $167,000 of the $298,000 spent by the company. The grounds: While the company spent the money in good faith; its rate of growth did not require it. Yet the PUC also ruled that it would be the stockholders who would benefit from promotional activities.

It is interesting to speculate at this point how a utility,

particularly one which is closely regulated, can pass the benefits of promotional activities on to its stockholders since any increase in earnings arising from such promotion would be very quickly handed to its customers by the commission. However, the court noted the commission's action, ". . . is clearly a substitution of the commission for the company in the management of the utility."

Merchandising Department Losses—The court held that neither losses or gains from this operation were to be considered in the rate-making process. The court noted in part, "Gains and losses of this type are taken and borne by the stockholders and not the ratepayers. In like manner, contributions to charity come from the stockholders."

KANSAS G&E ▶

Business is booming in Kansas, and Kansas Gas & Electric Co is riding along with it. That's the picture Gordon W. Evans, president and board chairman, sketched for the New York Society of Security Analysts recently.

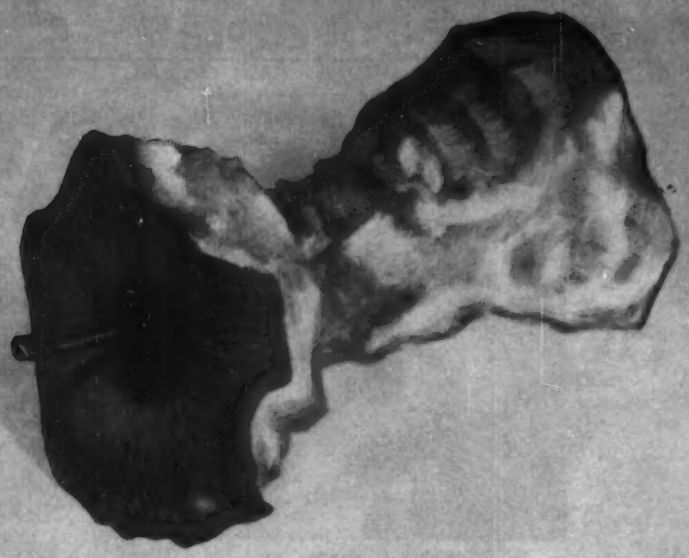
In the decade ending December 31, 1956, revenues almost tripled to $29.9 million. Net income followed along with a 19.7% hike during the period 1948—Sept. 30, 1957. And earnings per share for the same period rose 84%, or $1.07 per share (adjusting retroactively for a 2-for-1 stock split). Pertinent accounting note: Company has not taken liberalized depreciation or accelerated amortization. Book depreciation is straight line.

Whence this growth? Kansas raises one fifth of the nation's wheat, a like proportion of sorghum, and huge crops of other grains. To bring in this harvest, farmers are using more and more mechanization. The utility's large mineral reserves help feed fast-growing Kansas industry. Soil and water conservation program is designed to help boost farm production. The state ranks fifth in crude oil output, the same for natural gas, and takes sixth place in natural gasoline production. Over 3,000 industries are in the state, 1,200 within Kansas G&E's service areas. Industrial revenues last year reached $9,837,954—3.1 times higher than 10 years ago.

Total revenues from the chemical industry will reach $1 million this year. The company has been giving advice, help, and money to local Chambers of Commerce and area-wide associations to aid area development. An aggressive sales program has helped push up the company's revenues. Use per residential customer last year increased 15.7% over the prior year, almost twice the national rise. The sales department pushes services that will fit into the load curve, i.e., electric heating to offset the summer air conditioning load. An "All Element Home Lighting Program" and "Bronze Award Plan for Wiring and Lighting" (adapted by LBE) has helped sales. So have low rates. Only two privately serviced cities have lower residential rates than Wichita. Kansas G&E has never had a general increase, thanks, in part, to rapidly growing per customer use.

Tight budget control and increasing mechanization have held the reins on expenses. More efficient power plants reduce fuel costs to 2.12 mills per kwhr. Along with revenue growth has come plant expansion. Peak load increased 251% in the decade ending in 1956, when it reached 401,700 kw. Installed plant capacity swelled to 4⅔ times the '46 figure. Over the last ten years Kansas G&E spent almost $106 million on new plants and facilities.

The construction program includes a new 116,000 kw unit in an existing plant, and a power plant near Wichita, to be in operation in 1961 with an initial 165,000 kw capacity. Between 1957 and 1961, Kansas G&E plans to spend about $67 million. It will need financing in the summer of 1958 (probably $8 million in bonds) and more in 1961.



WHO OUGHT TO PAY FOR THE APPLE?

Common logic says, the man who ate it. He receives the benefit, nobody else.

But those who favor "public power" don't concur. They say some people should get the electricity that they consume tax free—and others should ante up the difference with a smile.

The reasoning of the "public power" advocates goes like this: The water that generates power is a gift of nature and should not be allowed to fall into private hands.

Gift of nature it is—like coal, oil, minerals, or any other natural resource. But no resource has any special value until it is extracted, harnessed, or otherwise made useful by human effort. And this effort, which is "privately" exerted by individual men and women, is the real cost of the final product and accounts for by far the greater portion of its price.

Whether produced by "public" or "private" agencies, the power extracted from water, or any source, must still be paid for. And the payment must cover essentially the same costs—labor, tools, materials, and the interest on invested funds.

The "public power" people further say there is a saving when public power agencies do the job, since such agencies pay no taxes. But taxes "saved" by public power agencies are lost to the public treasury and have to be recovered from some other source. What people appear to save as consumers of "public" power, they must give back as taxpayers. Some people do benefit, sure—but at the expense of others. There is no saving to the people as a whole.

So the question of power boils down to this: Under what type of organization—"private" or "public"—is power most likely to be produced most economically, and paid for by those who reap the benefits?

The Western World gave its answer many years ago, after centuries of unhappy experience with "public" control of economic activity.

The answer has paid off richly in terms of efficiency, equity, and freedom.

Are we going to let those gains spill over the dam?*

*Based on material from The Guaranty Survey, published by Guaranty Trust Company of New York.

Leaflets, reprints and newspaper mats available at cost in page size for publication of this message locally over the signature of your company. Address EW-1, Guaranty Trust Company of New York, 140 Broadway, New York 15, for further information.

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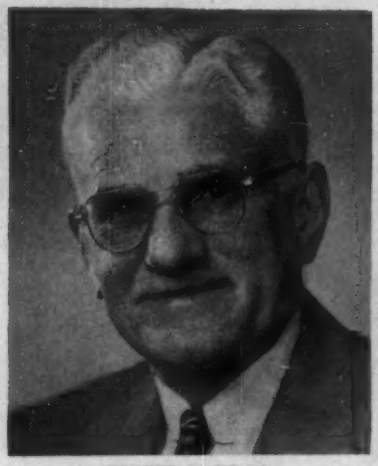


ERNEST S. FIELDS

WILLIAM H. ZIMMER

Fields and Zimmer Named to Key CG&E Posts

In top executive promotions, Cincinnati Gas & Electric Co elected Ernest S. Fields as president and chief executive officer and William H. Zimmer as executive vice president, treasurer, and chairman of the finance committee. Walter C. Beckjord, president and chairman of the board for the past 12 years, continues as board chairman.

Fields has been serving as vice president and general manager for over nine years, and has held a vice presidential position since 1943. A 43-year CG&E man, Fields has also been active in American Institute of Electrical Engineers (as vice president and board member) and in Edison Electric Institute (as ex-chairman, engineering division).

Zimmer comes to his new post after holding the offices of vice president and treasurer since 1946. His affiliation with the company began in 1920 when he joined the treasury department of the former Union Gas & Electric Co.

Detroit Ed VP's Four

A. S. GRISWOLD

D. F. KIGAR

Detroit Edison Co has promoted four executives to vice presidential positions. They are Arthur S. Griswold, for industry and public information; Donald F. Kigar, union relations; Sylvester F. Leahy, employee relations; and Chester F. Ogden, purchases and real estate. Marshall Pease was made manager of purchases and real estate.

Griswold, industry assistant to Pres Walker L. Cisler since 1952, will continue all present responsibilities in his new position. A 35-year employee, he has also been government consultant on electric power to Foreign Operations Administration and its predecessors.

Kigar has been manager of the union relations dept since its creation in 1953. Since joining the utility in 1926 he has also been manager of construction and assistant manager of purchases.

Leahy, manager of employee relations since 1953, will continue in these responsibilities. An electrical engineering graduate of University of Michigan, he joined Detroit Ed in 1931.

Ogden has been manager of purchases and real estate since 1952. In 1955 he was on a loan assignment with Office of Defense Mobilization as assistant director for materials.

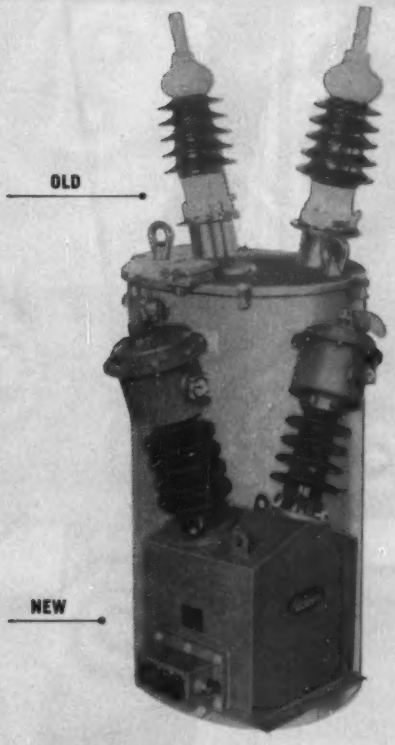
S. F. LEAHY

C. F. OGDEN

OUTDOOR METERING TRANSFORMERS...

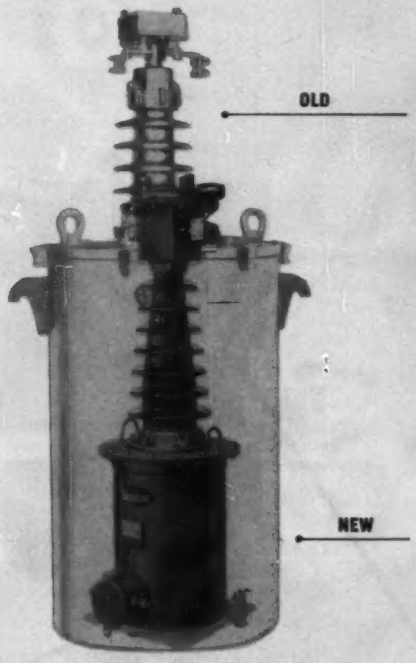
...accuracies within 0.3% at all ASA standard burdens

Standard Transformer's new line of completely redesigned outdoor metering transformers gives maximum accuracy on all metering applications. The vacuum impregnating process removes all traces of air from the heated core and assembly, resulting in the highest dielectric strengths. The new line conforms to all ASA, EEI and NEMA mounting and accuracy standards. These transformers are smaller and lighter than ever before. For specifications and certified dimension prints, see your nearby Standard Representative or write directly to us. You'll increase your accuracy where it counts most—ahead of and at the meter.



TYPE PXO OISC POTENTIAL TRANSFORMER

—outdoor type. Up to 69,000 volts primary; 120 volts secondary and secondary terminal box. Also available with single bushing for line to ground connection.



TYPE CWO OISC CURRENT TRANSFORMER

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LIVE BETTER ELECTRICALLY

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"WHEREVER THERE IS POWER"

"Heads-up" wiring in Texas...

...as Crain Electric installs Rome's tough power cable at Amarillo's new Olsen Park school

For the long cable pull on this job—from transformer vault to the service connection on the pole—Crain Electric Company needed a tough, abrasion-resistant cable. That's one reason they installed Rome's Rozone-Roseal power cable.

Here are the other reasons why this rugged cable is ideal for almost every type of high-voltage installation—either underground or overhead:

Special polyethylene protection. Roseal is a special flame-retardant polyethylene developed by Rome Cable. It provides excellent resistance to abrasion, moisture, weathering, oils, and most chemicals; and it is considerably easier to pull than other cables. You can install Roseal-jacketed cable underground or overhead, in climates as distinctly different as Amarillo's and Duluth's, and still enjoy the benefits of long cable life.

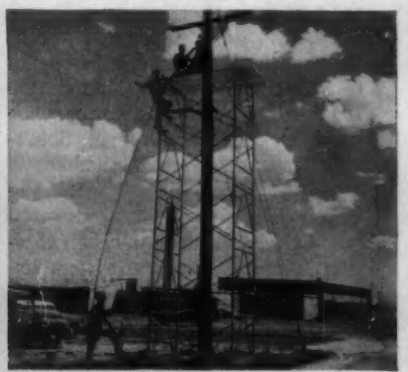
Water and ozone-resistant insulation. A special oil-base insulation—Rozone—assures protection against ozone cutting and moisture. High dielectric and impulse strength makes it an outstanding choice for your high-voltage installations. And its unusual resistance to moisture permits you to bury this cable safely in areas where it must remain immersed in water for long periods of time.

Specify Rome's Rozone-Roseal for your next job. Contact your nearest Rome Cable representative for more information—or write to Department 717, Rome Cable Corporation, Rome, New York.

ROME CABLE
CORPORATION

UNDERGROUND OR OVERHEAD. Power cable leaves reels for underground installation to pole. It's also ideal for overhead use.

EASY TO PULL. This Crain Electric Company workman guides Rome's high-voltage power cable into conduit at the start of a 250-foot pull from Amarillo's new Olsen Park school.



LONG CABLE LIFE. Crain's crew prepares to make the overhead service connection. Because this tough power cable is highly resistant to abrasion, moisture, and weathering, long cable life is assured.

NEES Promotes Gronbeck

John W. Gronbeck has been appointed safety manager of New England Electric System to succeed Fred G. Harrison, retired.

Since 1954 Gronbeck has been NEES assistant safety manager, a post now assumed by Clinton L. Pendleton.

Gronbeck's experience in the utility field started in the twenties, when he joined Lynn Gas & Electric as steam plant operator. Since then he has been with various NEES subsidiaries as load dispatcher, assistant chief dispatcher, and superintendent of electrical operations.

Kahler Becomes VP at I-T-E

I-T-E Circuit Breaker Co's newly created position of vice president of employee relations has been assumed by Karl K. Kahler.

He was previously vice president of employee relations at BullDog Electric Products Co, a subsidiary.

Kahler joined the I-T-E organization in 1945 as personnel director for BullDog. He had formerly supervised employee relations activities at Chrysler Corp and other firms. He is a member of the job evaluation committee of the National Electrical Manufacturers Association.

PERSONAL BRIEFS

B. E. Lowe has joined Sierra Pacific Power Co as assistant to the president. He has been sales manager of Trans-Canada Pipe Lines, Ltd, for the past three years.

New general commercial manager of Western Light & Telephone Co is **Charles F. Edwards,** former vice president and treasurer of Southwest Kansas Power Co, Inc.

Union Electric Co has advanced **Ned Crider** to distribution staff engineer, **Ernest A. Fisher** to system distribution engineer, and **Joseph P. Woodward** as assistant system distribution engineer.

At Montana-Dakota Utilities Co, **Howard Olson** succeeds retiring **Loyle Goss** as Forsyth district manager . . . Washington Public Power System has named **Mark D. Stenson** as assistant to **Owen Hurd,** managing director.

The new Nuclear Information Division of Kentucky's Dept of Economic Development is headed by **Robert H. Solomons, III,** former information officer at AEC's Oak Ridge facilities.

New president of New Jersey Utilities Assn is **Charles E. Kohlhepp,** president of Jersey Central Power & Light Co and New Jersey Power & Light Co.

Southern Canada Power Co has appointed **E. L. Jowett** as treasurer and **H. A. Ladouceur** as assistant treasurer . . . **Harold A. Smith** has been named assistant general manager-engineering of Ontario Hydro.

At New Brunswick Electric Power Commission, **P. C. Levesque** has been elevated to manager of distribution; **H. V. Denyer** to manager of production; **A. J. Cyr,** to technical assistant to the chief engineer; and **A. J. O'Connor** to executive assistant to the chief engineer.

The Professional Engineers of Oregon have elected Portland General Electric Co's **Ellsworth R. Fletcher** as president . . . **Alexander Finlay** has been made chief of Battelle Memorial Institute's Electrical Engineering Division.

At recent first annual meeting of Carolinas Virginia Nuclear Power Assn, **Norman A. Cocke,** Duke Power Co president, was re-elected president and **O. J. Miller,** Duke's executive VP, was named executive VP. Named as vice presidents were **L. V. Sutton,** Carolina Power & Light president; **E. H. Will,** Virginia Electric & Power Co president; and **S. C. McMeekin,** South Carolina Electric & Gas Co president.

Union Carbide Corp has appointed **Sylvan J. Cromer** vice president of engineering of its UC Nuclear Co.

The Mid-Atlantic region of Allis-Chalmers Manufacturing Co's Industries Group has promoted **C. W. Parker, Jr,** to manager of the Philadelphia district; **A. D. Brown,** to the regional office staff; **J. M. Mathews** to Richmond district manager; and **Gordon Hood** to Charleston district manager.

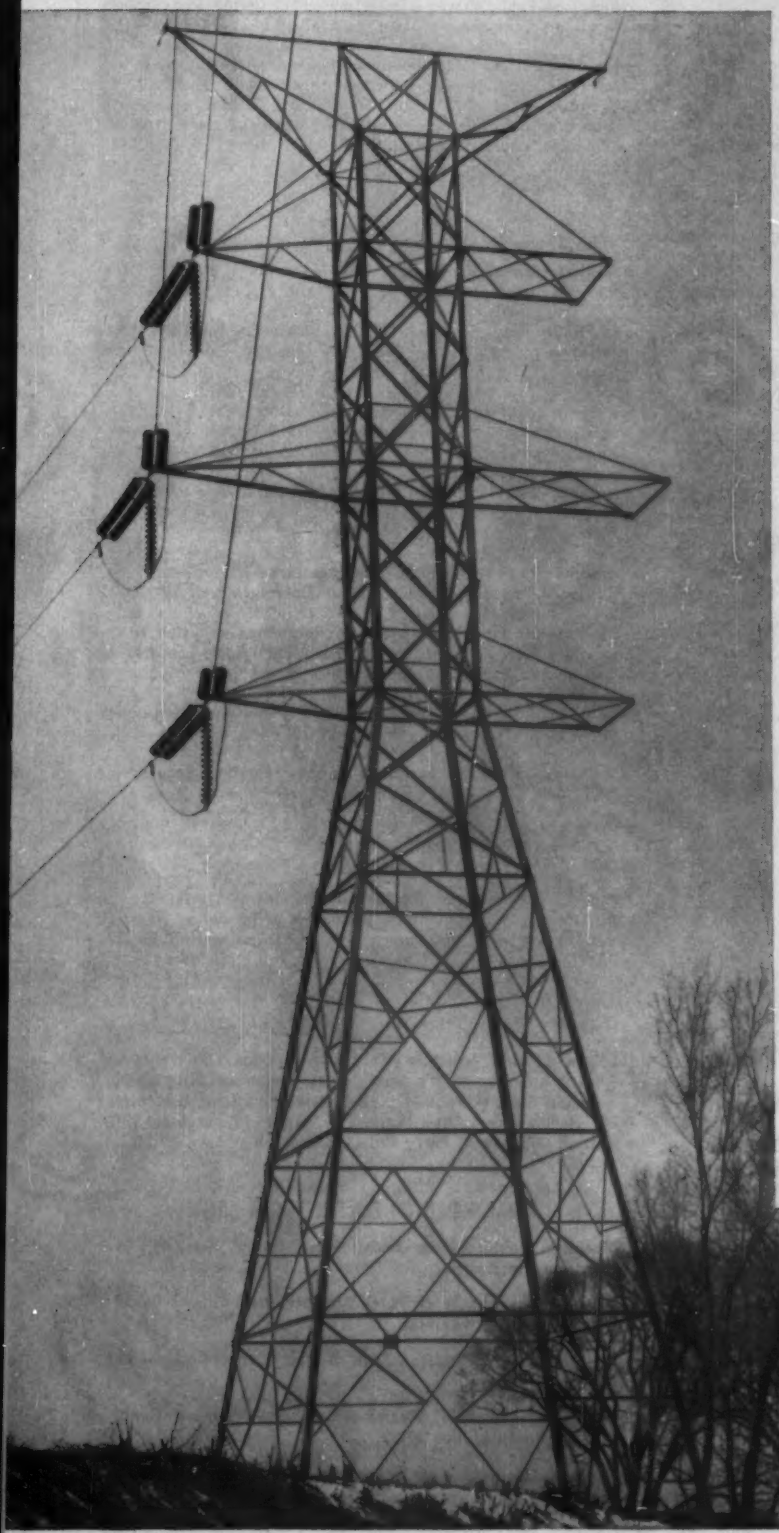
Warren S. Jones has been named assistant to Sales Manager **Richard H. Bamford** at Rockbestos Products Corp . . . At Westinghouse Electric Corp, **Donald F. Bone** is new manager of the renewal parts center, Appliance Divisions.

OBITUARY

Harry S. Dorman, 67, assistant to the Bonneville Power Administration head and former director of Oregon department of finance and administration, died recently.

John J. Gilbert, 70, of Simplex Wire & Cable Co's Submarine Cable Division, died recently in Portsmouth, Mass., after a prolonged illness.

14% weight saved in tower members of USS MAN-TEN High Strength Steel



THE LINE IN THE PICTURE is the Gardenville-Perry 230 kv line near Buffalo, owned by the New York State Electric & Gas Corporation, Binghamton, N. Y.

54 towers were erected in one nine-mile stretch. Longest span was 1,270 feet; highest tower was 128 feet. 180 tons of USS MAN-TEN high-strength low-alloy steel was used for all tower main legs and some of the bracing. Had regular structural carbon steel been used in the same members, it would have required 210 tons—some 30 tons more—to do the same job. This adds up to a 14% material saving which, of course, is in addition to the saving achieved in freight and erection due to the lighter weight of these pieces.

Weight was shaved because USS MAN-TEN steel has a yield point 50% higher than structural carbon steel—yet it costs very little more. Consequently, you can reduce the thickness (and the weight) of many tower members without sacrificing strength or durability.

Send for our 174-page booklet, "Design Manual for High Strength Steels." It covers USS MAN-TEN and our other famous high strength steels, USS COR-TEN and USS TRI-TEN. Write on your company letterhead to United States Steel, Room 5658, 525 William Penn Place, Pittsburgh 30, Pa.

United States Steel Corporation, Pittsburgh
American Steel & Wire Division, Cleveland
Columbia-Geneva Steel Division, San Francisco
National Tube Division, Pittsburgh
Tennessee Coal & Iron Division, Fairfield, Ala.
United States Steel Supply Division, Warehouse Distributors
United States Steel Export Company, New York

UNITED STATES STEEL

"USS," "COR-TEN," "MAN-TEN," and "TRI-TEN" are registered trademarks.

MEETINGS CALENDAR

DECEMBER

Interstate Power Club—Hotel Martinique, New York City, Dec. 9.

Edison Electric Institute—Accounting Division Depreciation Committee, sponsored jointly with AGA, Lord Baltimore Hotel, Baltimore, Md., Dec. 9-10; Commercial Cooking & Water Heating Committee, Detroit, Mich., Dec. 12-13; EEI-AGA Customer Activities Group, Accounting Employee Relations Committees, Netherland Hilton Hotel, Cincinnati, Ohio, Dec. 12-13.

Electric Companies Public Information Program — Steering Committee, Palmer House, Chicago, Ill., Dec. 10.

Electric Companies Advertising Program—Management Group, Palmer House, Chicago, Ill., Dec. 12.

Electronic Industries Association—Conference on Maintainability of Electronic Equipment, University of Southern California, Los Angeles, Calif., Dec. 18-19.

JANUARY—1958

International Home Furnishings Market—Including Appliance Show, The Merchandise Mart, Chicago, Illinois, January 6-17.

Edison Electric Institute—Home Service Committee, Chicago, Ill., Jan. 8; 2nd Annual LBE National Womens' Conference, Edgewater Beach Hotel, Chicago, Ill., Jan. 9-11; Industrial Relations Committee, Mayflower Hotel, Washington, D. C., Jan. 16-17; Dealer Coordination Committee, EEI Headquarters, New York City, Jan. 30-31.

Instrument Society of America—Boston Section, Yankee Instrument Fair & Symposium, Hotel Bradford, Boston, Mass., Jan. 14-15.

Industrial Heating Equipment Association — Penn Sheraton Hotel, Pittsburgh, Pa., Jan. 27-28.

American Society of Heating and Air-Conditioning Engineers—64th Annual Meeting, Penn-Sheraton Hotel, Pittsburgh, Pa., Jan. 27-29.

Home Improvement Products Show—Hotel Sherman, Chicago, Ill., Jan. 27-29.

FEBRUARY

National Association of Purchasing Agents—Public Utility Buyers Group Mid-Winter Meeting, Sheraton Hotel, Philadelphia, Pa., Feb. 2-4.

National Rural Electric Cooperative Association—Annual Meeting, Memorial Auditorium, Dallas, Tex., Feb. 2-6.

Edison Electric Institute — Prime Movers Committee, Penn Sheraton Hotel, Pittsburgh, Pa., Feb. 3-5; Industrial Power & Heating Group, Netherland Hilton Hotel, Cincinnati, Ohio, Feb. 6-7; EEI-AGA 1958 Conference Final Planning Meetings, Ben Franklin Hotel, Philadelphia, Pa., Feb. 6-7; Electrical Equipment Committee, Dayton Biltmore Hotel, Dayton, Ohio, Feb. 10-11; Transmission & Distribution Committee, Lord Baltimore Hotel, Baltimore, Md., Feb. 11-12; Meter & Service Committee, Sheraton Hotel, Philadelphia, Pa., Feb. 17-19; Industrial Relations Committee, (joint dinner with AGA Personnel Practices Committee) AMA Mid-Winter Personnel Conference, Feb. 20.

Industrial Electrification Council—National Industrial Heating Conference, Netherlands Hilton Hotel, Cincinnati, Ohio, Feb. 3-6.

American Institute of Electrical Engineers—Winter General Meeting, Statler and Sheraton-McAlpin Hotel, N.Y.C., Feb. 3-7.

Missouri Valley Electric Association—Industrial & Commercial Sales Conference, President Hotel, Kansas City, Mo., Feb. 6-7.

NATIONAL ELECTRICAL WEEK WILL BE OBSERVED FEBRUARY 9-15.

American Public Power Association—Engineering & Workshop Meetings, Chattanooga, Tenn., Feb. 13-14.

National Society of Professional Engineers—Spring Meeting, Michigan State University, East Lansing, Mich., Feb. 13-15.

American Institute of Mining, Metallurgical, and Petroleum Engineers—Annual Meeting, Hotel Statler, New York City, Feb. 16-20.

MARCH

Southern Safety Conference, Inc—Exposition, Peabody Hotel, Memphis, Tenn., March 2-4.

Lighting Lamps and Electrical Manufacturers Salesmen's Association—First National Lighting Exposition, Coliseum, New York City, March 9-12.

Nuclear Congress—Co-sponsored by American Society of Mechanical Engineers and the Engineers Joint Council, International Amphitheater, Chicago, Ill., March 16-22.

National Association of Corrosion Engineers—Annual Conference & Exhibition, Municipal Auditorium, San Francisco, Calif., March 17-21.

American Society of Mechanical Engineers—Management Conference Committee, Hotel Somerset, Boston, March 19-20.

Edison Electric Institute—Industrial Relations Committee, Headquarters, New York City, March 20; Annual Sales Conference, Edgewater Beach Hotel, Chicago, Ill., March 24-27.

American Power Conference—20th Anniversary Meeting, Sherman Hotel, Chicago, Ill., March 26-28.

Southeastern Electric Exchange—Annual Meeting, Boca Raton Hotel and Club, Boca Raton, Fla., March 31-April 2.

APRIL

American Society of Mechanical Engineers—Conference of Instruments and Regulators, University of Delaware, Newark, Del., April 1-3; Maintenance and Plant Engineering Conference, Penn-Sheraton Hotel, Pittsburgh, Pa., April 14-15.

American Welding Society—Annual Meeting and 6th Welding Show, Statler Hotel, St. Louis, Mo., April 14-18.

Edison Electric Institute—EEI-AGA National Conference of Electric and Gas Utility Accountants, Shamrock Hilton Hotel, Houston, Tex., April 14-16; Industrial Relations Committee, EEI Headquarters, New York City, April 17, Accident Prevention Committee, Perry Hotel, Toledo, Ohio, April 27-30.

MORE BIG DATES FOR '58

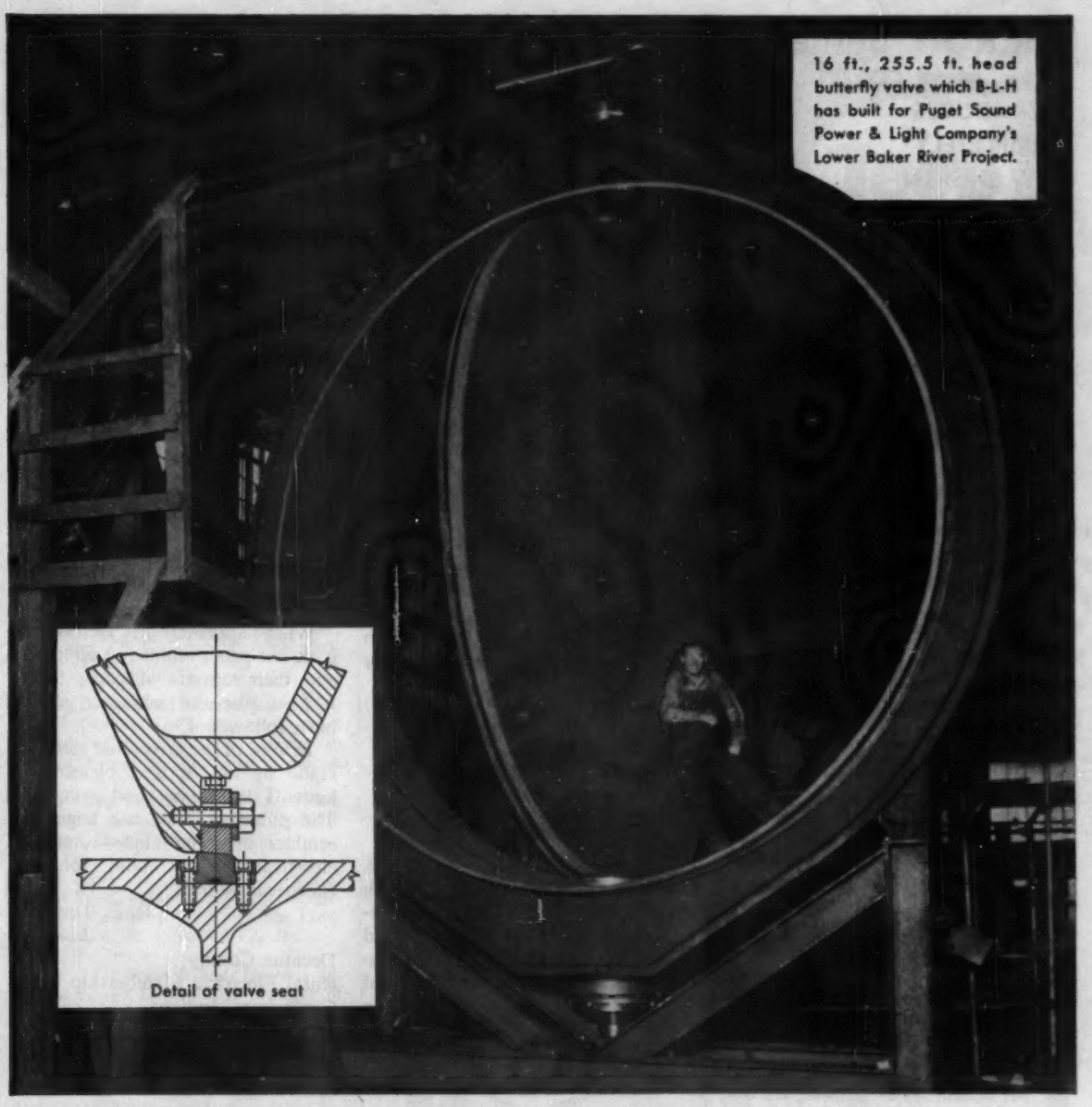
American Public Power Association—Annual Meeting, New Orleans, May 6-8.

National Association of Purchasing Agents—Annual Convention, Chicago, May 11-14.

Edison Electric Institute—26th Annual Convention, Boston, June 9-12.

American Institute of Electrical Engineers—Summer General Meeting, Buffalo, June 22-27.

National Electrical Manufacturers Association—Annual Meeting, Atlantic City, Nov. 10-14.


16 ft., 255.5 ft. head butterfly valve which B-L-H has built for Puget Sound Power & Light Company's Lower Baker River Project.
Detail of valve seat

Adjustable seat designed by B-L-H for butterfly valve cuts leakage to minimum

Built for the Puget Sound Power & Light Company, this hydraulically operated B-L-H butterfly valve reduces leakage to a minimum by means of a specially designed valve seat that is simply and quickly adjusted. Since it is used to effect complete closure in emergencies caused by failure of the wicketgates to operate, as well as during scheduled shutdowns of the turbine, the need for a valve that will virtually eliminate leakage is vital.

Through its Eddystone and Pelton Divisions, B-L-H has built hundreds of butterfly valves of all sizes. In addition, B-L-H manufactures governors, pumps, surge suppressors, all four basic types of hydraulic turbines, and related equipment.

For illustrated bulletins, write to B-L-H Corporation, Philadelphia 42, Pa., or Pelton Division (B-L-H), 2929 Nineteenth Street, San Francisco 10, Calif.

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Clamping Range-.160-.522 in.

The lowest priced dead end clamp on the market that will develop more than the rated strength of 1/0 ACSR and 4/0 copper

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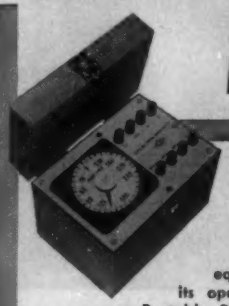
PORTABLE PHASE ANGLE METER



Completely self-contained, and requiring no auxiliary equipment for its operation, this Portable Phase Angle Meter offers a direct way of checking relay and instrument connections, particularly directional over-current relays, differential relays or similar equipment. It may also be used to measure the prevailing power factor in each phase of a polyphase watthour meter installation. The device has a frequency of 60 cycle, with voltage ranges of 60, 120 and 240 volt. Current ranges are 1, 2.5 and 5 amp. . . . DIMENSIONS: 9½ x 6¾ x 5¾ inches. Weight 19 pounds.

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READERS FORUM

Highest–Not Largest

To the Editor:

Pacific Power & Light is very proud of the superlatives that are required for descriptions of our Swift hydroelectric project, and Electrical World's excellent account (EW Sept. 2, Pages 8-89) of the foundation zone construction detail, but we want to be the first to note that Swift will be the highest—and NOT the largest—earth fill dam in the world.

Swift's 15,300,000 cubic yards of material places it considerably behind Ft. Peck on the Missouri in size, in the neighborhood of 24,000,000, cubic yards of fill.

In all other aspects, EW's account was timely, to the point of Swift's unique contribution to construction methods, and well illustrated.

James H. Gerguson
News Director
Pacific Power & Light Co.

Two-Cycle Tripping

To the Editor:

Please refer to the October 28 issue of "Electrical World", page 90, New Equipment section. A very unfortunate thing happened here, and that is the omission of references to the 2-cycle instantaneous tripping of the recloser described. Somehow the word "two" was omitted, and as you can see, this was a very important part in the recloser operation.

We are very anxious to have this fact covered in the news, and would like to have you consider ways and means of covering this point. Since we indicated to you that we do not propose running special advertising on this product until January, it would be well to somehow cover it in one of the forthcoming issues.

Eric Zimmerman
Advertising Manager
R & I E Equipment Division of
I-T-E Circuit Breaker Company
Greensburg, Pa.

Every Page Is Important

To the Editor:

What happened? My October 14 issue has pages numbered up to 136 and then reprints of pages 97 to 112 in place of whatever should have followed 136.

In view of the errors and mistakes made by me, it is a pleasure to know I travel in good company. The publisher must use a gas assembler of some kind—surely no electrical gadget could foul up *Electrical World*.

R. E. Thomson
Manager
Decatur County
Rural Electrical Membership Corp.
Greensburg, Indiana

Brackets Needed

To the Editor:

In reviewing my article "Coordinate Generator Prewarming with Controlled Turbine Starting" (EW, Aug 19, 1957, pg 88), I noticed that equation (5) was printed wrong on page 89. The brackets were left out which, of course, will provide an incorrect value of field current I. The correct expression is:

$$I = \sqrt{\frac{1.714[(WC_p)_{Cu}(t_2 - t_1) + (WC_p)_{Fe}(t_2 - t_1)]}{3.413\ R\ \theta}}$$

Because Electrical World is widely read, you may want to pass on this correction to your readers.

C. B. Scharp, Engineer
Power Production Stations
Baltimore Gas & Electric Co
Baltimore, Maryland

SALES ASSIGNMENTS

COMPANY STAFFS

Anderson Electric Corp's new sales representative in Chicago is W. J. Dres, who will cover northern Illinois, eastern Wisconsin, and the upper Michigan pensinsula.

Essex Wire Corp has named John Fiske to manage and supervise its new warehouse at Superior Ave, Cleveland.

General Electric Co's Large Steam Turbine-Generator Dept has appointed Leland D. Whitescarver as manager-sales, Region Three. He will be responsible for the southeastern and southwestern districts of GE's Apparatus Sales Division and for liaison with Canadian GE and International GE . . . The User Industries Sales Dept has designated Milton F. Kent as manager of apparatus product sales, with headquarters in New York City.

Graybar Electric Co, Inc, has named M. P. Johns and H. G. Cook as managers for the Mississippi Valley and Ohio Valley districts, respectively. W. E. Iseli has been made manager at Eugene, Ore., and C. E. Knab at Columbus, Ohio.

Indiana Commercial Filters Corp has advanced Graham C. Thompson to sales manager of the Michiana Division to succeed Robert N. Burckhalter, retired.

Philco Corp has designated John Ryan as general manager of Philco Distributors, Inc, New York Division.

Radio Corp of America has named Robert W. Redecker as manager of sales and merchandising for Consumer Products Service, RCA Service Co, Inc.

Joseph T. Ryerson & Son, Inc, has advanced Joseph D. Gavin to manager of sheet and strip sales at the Chicago plant.

Square D Co has promoted John N. Daniel to Northwest regional manager, with offices at Seattle. He succeeds Daniel H. Miller, now Western Division manager at Los Angeles.

Thor Power Tool Co has named A. V. Moroz electric tool sales manager for the Chicago branch.

REPRESENTATIVES

Automatic Switch Co has named Ackerman Chacco Co, Inc, of Cincinnati, as authorized stocking distributors of Asco Solenoid valves.

Cornell-Dubilier Electric Corp has appointed Jake Rudisill Associates of Charlotte, N. C., to represent C-D's Power Factor Capacitor Division in North and South Carolina.

Harvey Hubbell, Inc, has appointed Avnet as exclusive national representative of its Interlock Division.

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Pay Of College Teachers... Where The Russians Are The Capitalists

This editorial deals with a simple question about college faculty salaries: Which country pays its teachers better, Russia or the United States? It's a good question, with a sadly embarrassing answer.

That American college and university teachers are underpaid is not a novel observation. But what has happened to the economic status of their profession can be put in more candid terms. **As far as financial incentives are concerned, we have virtually socialized the academic profession.** Teaching has become such a poorly paid career, with so little prospect of material reward for outstanding performance, that it simply does not attract enough highly qualified young men and women.

Ironically, the Soviet Union has deliberately and successfully used capitalist incentives to improve its educational system. Although the Russians show an utter disregard of civil liberties, they pay their teachers well and confer on them all the prestige and privileges the Soviet society can offer. Russian professors, together with party officials and scientists, have become the privileged upper class of a supposedly classless society.

Incentives To Be A Teacher

To be a college teacher requires high intellectual competence and long, sometimes costly, formal training. Aside from the appeal of academic life, what incentive does college teaching offer bright young men and women?

In the U. S., the average faculty salary is little more than the average income of industrial workers. According to the National Education Association, the average faculty salary is about $5,240. College instructors receive $4,100, associate professors $5,730 and full professors $7,100. The average income of U. S. factory workers in 1956 was $4,580.

Actually, workers in many industries — steel, automobile and petroleum, for example—earn more on the average than college teachers. And skilled workers often earn more than full professors at some of our colleges and universities.

In Russia, on the other hand, the young Soviet graduate can see that it pays — and pays very well — to choose teaching as a career. The head of a department in a Russian university can command a salary of about 6,000 rubles a month.* This is about eight times the income of the average Russian worker, who earns 750 rubles a month.

The Russian professor comes off very well in terms of what his income will buy. It has been estimated that, based on Soviet consumption patterns, 6,000 rubles a month is worth about $7,200 a year — or higher than the average professor's salary in the U. S. Of course, it is difficult to compare living standards in two countries as different as the U. S. and Russia. But particularly in the field of science — where the salaries can run to 15,000 or more rubles a month — it is clear that the Soviet professor enjoys a higher real income than that offered his American counterpart by a much more prosperous economy.

Incentives To Be A GOOD Teacher

Russia also offers much higher premiums than the U. S. to those who attain distinction in teaching. Teachers at the university level earn significantly more than teachers in high schools, and university instructors can look forward to a sharply progressive rise in earning power as they

* *Soviet Education for Science and Technology* by Alexander Korol of the M.I.T. Center for International Studies.

How Faculty Salaries Compare With Industrial Wages

(Worker's Wage In Each Country = 100)

*Sources: Center for International Studies, M.I.T.; National Education Association; McGraw-Hill Department of Economics

advance to higher positions. The spread between the income of a full professor and the lowest academic position is greater than fifteen to one. In addition, full professors can earn a healthy bonus if they are elected to membership in the Russian Academy of Sciences.

In the U. S., by contrast, full professors on the average earn less than twice as much as beginning instructors. And many college professors earn less than public school teachers in large cities. Even a full professor's pay does not compare with earnings in other professions or in positions in industry requiring similar training. The point was well summarized in a recent speech by Marion B. Folsom, Secretary of Health, Education and Welfare: "It is nothing short of a national disgrace that we are discouraging people who want to teach by offering salaries that are far below the levels justified by their training and far below the levels which others are willing to pay."

Our colleges and universities, as well as our teachers, find themselves in a serious predicament. Faced with a shortage of both funds and teachers, they cannot reward distinguished performances. Limited resources for salary increases have gone predominantly to the lower ranks, so that an adequate number of teachers could be retained. Meanwhile, potentially fine teachers are being siphoned off into better paid occupations.

The shabby treatment of our teachers threatens to undermine, not only our educational standards, but our free enterprise system itself. There is the recent example of a liberal arts college which discovered that five of its graduating seniors were being offered starting salaries higher than those paid any of their professors. It would be surprising if experiences like this did not place a strain on the enthusiasm with which these professors deal with some key aspects of American capitalism.

Also important is the role education is playing in the cold war with the Soviet Union. The Russians have made great strides in raising the quality of their education — particularly in science and engineering. Both the number and the technical calibre of their graduates are impressive, as recent Soviet achievements testify. These successes owe much to the generous economic treatment the Russians have given their teaching profession.

A Standard For Faculty Pay

Earlier editorials in this series have outlined various ways American business can help relieve the financial plight of our colleges and universities. They have suggested that private contributions to higher education should average at least $400 million a year over the next ten years if faculty salaries are to be raised to adequate levels and our colleges are to be able to meet increasing operating costs.

Another standard for raising faculty salaries proposed by an American businessman is this: "When a teacher's income gets up to a point where you will suggest to your boy that he ought to give some thought to teaching as a profession, then we may be approaching the right figure."

Russia clearly has set her teaching salaries well above the "right" figure. We are nowhere near it. What this adds up to is that the Communists — not we — have become the shrewd capitalists in the vital field of education.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nation-wide developments. Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

Donald C. McGraw

PRESIDENT

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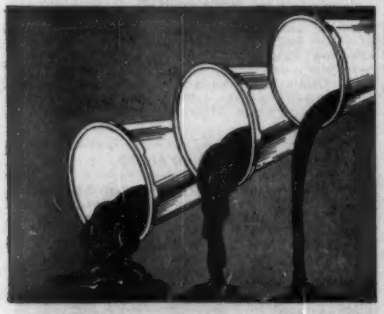

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Dunn: It means that most of the active material is still locked in the spiral lead buttons unique with Exide-Manchex Batteries.

Reporter: Do today's Exide-Manchex Batteries have the same long life potential?

Dunn: Even better. Because the batteries made today incorporate significant improvements in materials and construction that assure even greater length of service and better performance than these batteries were ever capable of before.

Reporter: What do these advantages mean to battery users?

Dunn: Greater economy and more dependability—the two qualities that have made Exide-Manchex Batteries world famous for years.

Note to battery users: Whenever you order batteries for float or cycle service in stationary applications, be sure to specify Exide-Manchex. Write for detailed bulletin. Exide Industrial Division, The Electric Storage Battery Company, Phila. 2, Pa.

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